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Building Timbers

AND

Architects' Specifications

By J. DAVIES

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PREFACE

THIS book differs from the many excellent existing works upon Timber now available, inasmuch as it confines its notice to those woods which have been, are, or promise to be, of special interest to the architect, contractor, builder, timber merchant, and student.

It deals with the commercial side of the subject, and keeps in view the particular requirements of the architectural profession and the building and timber industries.

It also deals briefly with woods which, though not in regular use for building, are of sufficient general interest to warrant passing notice, and it supplies an extensive list of Canadian and Australian woods often used in the Colonies, which may come into use in this country.

Our thanks are due to a number of eminent timber firms who have been consulted concerning certain woods they especially handle.

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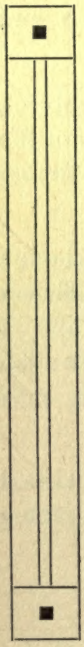

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Building Timbers

—AND—

Architects' Specifications.

CHAPTER I.

COMMON ERRORS IN THE SPECIFICATION OF TIMBER.

Ambiguous clauses.—The architect or engineer who supervises the carrying out of any contract involving the use of timber is called upon to issue a "specification," defining the nature and quality of the wood required. This specification is intended to protect his clients' interests, and guide the contractor in the selection of the right material. To secure the accurate realisation of the architect's design, therefore, it is above all things necessary that the clauses in such specifications which define what may or may not be used should be intelligibly and distinctly worded, conveying to the mind of the contractor a definite idea as to what is wanted. Unfortunately this is just what many of the clauses in general use do not achieve, and it is largely with a view to assisting the architect and contractor, by correcting current errors and disseminating up-to-date information respecting the commercial use of timber, that this book is written.

Purpose of this book.—It is not a botanical treatise, and is specially concerned with a description of the character, forms, and places of origin of building timber as imported to-day. It is intended to show the architect what to specify, and the builder and contractor what to use, while the revised forms of specification which it presents will be such as the timber merchant of to-day can work to with satisfaction to all parties concerned. Those familiar with the working of the building trade are aware that the out-of-date and obsolete phraseology used in many of the specifications referred to is sadly in need of reform. Disputes and misunderstandings are continually arising. Forms of timber are specified which it is impossible to obtain. The kinds which are most suitable and easily obtainable are not specified at all. On the one hand, clients may be paying for a more expensive article than they need, and on the other, the inevitable substitution of purchasable for unpurchasable forms may result in their receiving something inferior to that which they are entitled to.

Faults in specifications.—The faults that are usually found in the specifications referred to may be tabulated as follows:—

(1) Failure to convey a clear idea of the exact standard of quality required.

(2) The inclusion of forms of timber which are no longer imported.

(3) The ruling out, by implication, of the newer and more useful varieties.

(4) The specification of unusual and rarely-imported dimensions, and the consequent exclusion of

easily obtainable, more economical, and equally useful dimensions.

In studying the chapters which deal respectively with the various woods, the reader will derive the more benefit by keeping these common errors in mind, if only as examples of *what to avoid*. They are therefore considered in detail in the following pages.

DEFINITION OF QUALITY.

What are defects?—The timber of commerce, being a commodity which is not made, but grown, is afflicted with a varying proportion of defects, in the form of sap, shakes, knots, &c., and most of the disputes which are continually arising in connection with its use are centred round the question,

> "What, if any, measure of defect can reasonably be allowed to pass?"

In the legitimate and laudable desire to maintain a high standard of work, it is usual for architects to instruct builders carrying out work under their supervision that the timber shall be

> "Free from sap, shakes, large and loose knots, and all other defects."

If the supply of perfect timber were large enough, and if all clients' pockets were long enough to pay for it, the rigid application of this standard would solve the problem. But the proportion of wood free from defects which it is possible to obtain is so small, and its cost is so prohibitively high, that in practice there is a general admission that the standard cannot be severely applied to any but the best work.

What is "best"?—Of course, there is a sense in which there should be no work but the best work. And it is no part of the writer's intention to connive at the use of shoddy material. But the word "best" really means best adapted to the circumstances of each particular case. The "best" material for the suburban villa is that which permits the man of moderate means to live in comfort at a reasonable rent. In such a case the choicest and most expensive materials would not be by any means the best to specify and use. On the other hand, the erection of a cathedral or mansion may fairly justify the rejection of anything but the best that money will buy. Between these limits there are many grades of work, respecting which it is impossible to lay down rigid rules as to the exact shade of excellence demanded in the quality of the materials used. But something may be said in the enunciation of general principles, for the guidance of both designers and executants. Indeed, it is urgently called for, in view of the manifest absurdity of using one stereotyped form to cover public buildings, Park Lane mansions, banks, factories, and ordinary dwelling-houses.

It may be assumed that the architect wishes to achieve two ends. He desires to give his client what he wants on the one hand, and to study his own artistic susceptibilities in the avoidance of the pretentious, the shoddy, and the banal, on the other. Now the position and purpose of the building, considered in relation to the money available for its completion, must determine the kind and quality of wood to be used, and it is the architect's object to pass on to the contractor, in the wording of the clauses which govern the woodwork, his own exact intentions on the point. The clauses in common use

only convey those intentions when the very highest class of work is in question, and as applied to all the others, from those immediately below the best down to the cheapest, they are unfair and misleading.

Wood insufficiently described.—It is not enough to name the wood or define its origin. There are five distinct qualities of ordinary building fir, to name an example, and the seconds from some ports are only equal to the thirds or fourths from others. Even the best quality, from the ports which send us the best wood, is not up to the standard indicated in the words "Free from sap, shakes, large or loose knots, and other defects." It will be seen, therefore, that the literal interpretation of the formula will have one of two results. If the builder in tendering has anticipated and allowed for it, the client is paying an enormous price for his timber, as compared with the average. If he has not prepared for it, the builder is carrying out that portion of the work at a very heavy loss.

Does the architect mean what he says?—It may be urged that no contractor has a right to assume that the architect does not mean what he says, or to tender for a cheaper article than that which is specified. But the very universality of the formula defeats its own object. When tendering for ordinary work the builder knows quite well that the client does not wish to pay for anything more expensive than the regular merchantable article which common experience has established as the usual thing. And in so far as the specifications call for anything better he regards them as mere figures of speech. Here we have all the materials for serious difficulties. When differences of opinion arise respect-

ing the quality of woodwork in a particular job, the two parties judge the timber by two different standards. The architect refers to his specification. The builder refers to precedents in the shape of similar material used and passed in other contracts of the same character.

The architect says: "You tendered for a clearly-defined standard of quality, and in my client's interest I must have it."

The contractor replies: "Your standard as defined was merely nominal, and unworkable. Neither was it a part of your client's intentions that anything of higher class than usual should be asked for. Had I read your specification literally I should never have secured the work. Had all the contractors who tendered read your specifications literally the prices would have been too high for your client. He would then have come to you and said 'Your design is too expensive. You must cut it down. Such and such a building, which is the sort of thing I want, only cost so much. Why must I pay more?'"

Workable formulæ.—This is a typical summary of controversies which are continually arising. Without taking sides in the matter, it is possible to affirm that such disputes could be avoided to a large extent if two or three alternative formulæ, to cover the various grades of work, were brought into common use. These alternative clauses will be found on pp. 160 to 165. Before dealing in detail with the defects existing in timber it may be of use to indicate the difference in cost between the ordinarily accepted qualities in joinery and carcassing softwoods, and the superlatively good standard which is indicated by the clauses usually found in

the bills-of-quantities of most contract work. It will surprise those who are unacquainted with the increasing difficulty of securing really high-class shipments of fir timber or red (yellow) deal, to learn that the difference would very rarely be less than 100 per cent., and would usually be more. The figures are quoted, not so much with the object of disparaging the use of the higher grade when needed, as to encourage the use on paper of more elastic formulæ for application to medium or good class work, bringing precept into line with practice.

DEFINITION OF ORIGIN.

Loose use of terms.—In addition to defining the name and quality of the wood to be used for contract work, it is usual to specify its place of origin. Within certain limits, this may be necessary in the case of some woods, but it is a limitation which should be used with the greatest care, for reasons which it is the business of this chapter to set forth. The important factor to be remembered in this connection is the change which is continually taking place in the timber trade all over the world. In some districts old forests are exhausted, and in others new ones are tapped. The building of railways and the establishment of fresh shipping connections divert the course of the traffic. In the first instance it is the place of origin that is changed, in the second the route and port of shipment. The recklessness in felling and indifference to regeneration which prevailed until recent years have wiped out many once fertile sources of supply, and the consequent search for new areas has resulted in the exploitation of resources which were unknown to the last generation. Old shipping firms have died out, and their successors

have worked on different lines, exporting timber in different forms and under different brands.

Old text-books useless.—Some of the standard publications on the subject of wood are of early date, and deal with the botanical and scientific rather than with the strictly commercial aspect of the matter. Hence architects, engineers, and contractors, in seeking to ascertain what are the most suitable forms of timber at present available for their work are apt to be misled by the out-of-date character of much that still passes for authentic information. The old formulæ, which conveniently fitted the timber trade in their day, are out of touch with current conditions. They have been copied and recopied, and frequently appear in newly-issued specifications. They are usually ignored by practical people, but now and then attempts to enforce their literal application are made with unfortunate results.

A softwood description to discard.—To take an important example, the staple structural wood of the building trade (*Pinus sylvestris*, variously known as fir, red deal, yellow deal, Scotch fir, and Northern pine) was once imported from Memel, Dantzic, and Riga in logs, either roughly squared or round as falling. During the last 40 years, however, there has been a continuous tendency to import it in different form and from other places, the proportion of logs becoming smaller, and the proportion of sawn planks, deals, battens, and boards becoming larger. The dimensions have approximated more and more to the form in which the consumer requires them, until now scantlings down to so small a size as 2 by 3, planed flooring and matched boards,

moulding strips, slating battens, and plasterers' laths are regularly imported in enormous quantities.

Consequently, it is no longer necessary to specify that the scantlings for carcassing work shall be "Sawn from Memel, Dantzic, or Riga Fir," except in those rare instances where it is deliberately intended to exclude the imported planks, deals, battens, &c. Yet this formula is continually being met with in the wood-governing clauses of recent specifications, covering contracts on which there is no intention whatever to exclude the imported sawn stuff referred to.

Ports of origin changing.—The matter is further complicated by the fact that the ports which send us the best sawn joiners' and carcassing timber, such as Archangel, Petersburg, Soderhamn, Gefle, Hudikswall, &c., are not those from which the logs they have superseded used to come. While in the past the choice of "ports of origin" was limited to about a dozen, there are now in Russia, Sweden, Norway, and Prussia more than 100 places from which sound usable fir is regularly exported. It will thus be seen that the limitation of the contractor to certain specified shipments may inflict needless hardship by preventing the use of other equally good and more easily obtainable kinds.

Hardwoods wrongly described.—Similar difficulties arise in connection with the use of certain hardwoods, such as mahogany, teak, and oak. We now receive mahogany from Africa, teak from Java, and oak from Japan, the trade being a comparatively recent development in each case. It is not suggested that there may not be occasions on which the use of a particular

variety is desirable, but the copying of the old formulæ results in the exclusion of these newer arrivals by inadvertence and not by design. It is quite right and proper that an architect should forbid the use of material when its nature makes it unsuitable for his purpose, but it is unfortunate that excellent stuff should be barred merely because it had not been placed on the market when the originals of these limiting clauses were composed. When it is remembered that even those forests which enjoy the greatest advantages in the way of soil and climate will contain badly-grown trees, and that defects occur in the best of shipments, it will be seen that insistence on a particular brand or place of origin is not necessarily a guarantee of excellence, nor protection against disappointment.

Having determined the particular wood required for any given purpose, therefore, it is better to concentrate attention on the merits of the material itself than on its place of growth or commercial label, always excepting, of course, those cases where such woods as Austrian oak and Cuba mahogany are required for the production of a certain decorative effect. It is the aim of this book to give, in the chapters which deal with the various hard and soft woods in detail, such information as to sizes, qualities, and brands as will save the architect from the necessity of protecting his client by insistence on specific brands or shipments.

DEFINITION OF SIZE.

Difficult dimensions.—Quite as important as the matter of quality and origin is the correct specification of dimensions. In all engineering and building

work the paramount consideration must be the adequacy of the sizes used for stress bearing or structural purposes; and on the decorative side it is quite as necessary that visible woodwork should be in just and proper proportion to the general effect. It would be ridiculous to contend that the convenience of the builder or the timber merchant should be permitted to interfere with the realisation of the architect's intention on these points. Still, subject to their admitted precedence, there is sometimes a small margin which makes the choice between two alternative sizes a matter of indifference. In such cases, it will be the designer's wish to adopt the more economical of the two, and as the variation of a very small degree in width or thickness may effect a considerable saving, it will be useful to know what dimensions are regularly imported and easily obtainable. The importance of such knowledge will be realised when it is stated that a size like $2\frac{1}{4}$ by $5\frac{1}{2}$ will cost as much per lineal foot as $2\frac{1}{2}$ by 6, $3\frac{1}{2}$ by 10 as much as 4 by 11, and so on.

What are merchantable sizes?—A study of the staple merchantable sizes (which are given in detail in the chapters which deal with the various woods) will show that only in rare instances is it necessary to specify or use dimensions which are not included in the list. After all, the supply is regulated by the demand, and it will usually be found that the widths and thicknesses commonly stocked are just those which fulfil most completely the requirements of the user.

For example, joists and rafters in red fir or deal are imported in 4in., 3in., $2\frac{1}{2}$in., and 2in. thicknesses. Unless, therefore, a greater thickness is required for

very heavy work (in which case it would be sawn out of logs), these four dimensions will meet all cases. The specification of a ¼in. under any one of them will yield no saving, as the scantling would merely consist of one of these, reduced by removing a thin board of no marketable value.

The choice of imported widths, covering 5in., 5½in., 6in., 7in., 8in., 9in., and 11in., in combination with the thicknesses named, will be found to meet all requirements, and in most instances a demand for anything else is the result of lack of information on the matter. Sometimes irregular dimensions are called for by architects with the object of preventing the use of the smaller imported stuff. They consider the comparative smallness of the trees from which imported scantlings under 3 by 7 are sometimes cut involves immaturity and lack of durability in the wood, and endeavour to ensure that what is used shall be sawn from larger sizes. This is a perfectly legitimate attitude to take up, although the batten sizes of the better shipments should do for all but the highest class of work, and probably offer an advantage in the matter of dryness. Still, the object would be obtained more directly by inserting a clause in the specification to the effect that converted stuff is required.

A word on floorings.—Before leaving the consideration of softwoods in this connection, another illustration may be useful. Flooring boards of over 1in. nominal thickness increase in quarters of an inch, not eighths, being stocked in 1¼in. and 1½in. It is not economical, therefore, to specify 1⅛in. If what is commonly known as 1in. flooring is not thick enough, then 1¼in. should be specified. This leads up to the

consideration of another important point, viz., the use of the term "Finished sizes." In imported unplaned timber, the nominal and actual sizes are the same. But planed boards or scantlings are labelled with the size they measured before planing. Thus the 1¼in. flooring of commerce stands 1⅛in., and when a 2in. door is specified, the maker supplies it prepared from 2in. stuff, and it measures less than its nominal size by the thickness of wood removed when planing two surfaces. If flooring is required to stand 1in. finished, there being practically no 1⅛in. (nominal) boards imported, it has to be 1¼in. nominal (1⅛in. finished). And if a door is to finish 2in., the stiles and rails have to be specially cut, at a considerably higher cost than the 2in. nominal.

The object of this explanation is not so much to abolish the use of the expression "finished sizes" as to restrict its application to those occasions when the extra cost is justified by some particular object.

A note on hardwood sizes.—In hardwoods also an acquaintance with available resources is of great value. In the case of Cuba (sometimes specified as Spanish) mahogany, the reduced dimensions of the logs now available prevent the merchant or contractor from supplying very wide panels in one piece. So that the use of this very desirable wood is unavoidably accompanied by the necessity of jointing. If that process is deemed undesirable, the architect has to fall back on Honduras, which is procurable in larger sizes, though less rich in appearance.

It may be appropriate at this point to say that all freshly imported hardwood boards and planks actually measure their nominal thickness, but when sawn into

planks and boards after importation, the wood removed by sawing and consequent shrinkage in drying reduces them. Therefore the home-sawn seasoned mahogany, walnut, or other hardwood boards and planks do not yield their nominal thickness.

It will be readily conceded that a full acquaintance with such points as these will tend to obviate misunderstandings between clients, architects, and contractors in connection with the use of all forms of wood.

CHAPTER II.

RED OR YELLOW DEAL. (EUROPEAN).

(Pinus sylvestris.)

The staple building timber of commerce, as used for joinery and constructional work in the United Kingdom, is variously and confusingly known as red fir, red deal, yellow deal, Baltic fir, Scotch fir, Scotch pine, and Northern pine. Strictly speaking, it is not a fir at all, being the wood of a pine (*Pinus sylvestris*), but the word "Fir," though botanically incorrect, is so universally used in commerce to denote it that we adopt the popular terminology for present purposes. The shippers simply call it "Red" (fir, pine, or deal being understood), and the British timber trade use the same term in most places, "Yellow" being the common name in London and the South of England.

Where grown.—It is grown in Russia, Sweden, Norway, and Germany. The tree is found here and there in Great Britain and Ireland, but the forests are not extensive enough nor the trees sufficiently large or well grown to be commercially useful. There are isolated instances of the home-grown wood being converted for building purposes, but they are few and far between.

In passing it may be noted that the tree is mentioned in the Report of the Royal Commission on Afforestation (1908) as suitable for home cultivation, and is likely to be systematically grown in the near future; but it

cannot possibly yield good merchantable dimensions in less than 70 years. Meantime, the four countries named are now, and will remain, the source of our supplies, and form the place of origin of the stocks to be found in our timber yards to-day. While it is increasingly difficult to obtain from present available sources wood of the same good quality and maturity as in the past, there are in Russia and Scandinavia large tracts of forest land, which will be exploited as soon as a moderate advance in prices makes it profitable to work them.

The "timber famine" which we hear of is not likely to trouble us for some generations. What we must look for is rather a steady but not prohibitive increase in the price of this particular softwood, in common with that of timber generally.

Its general features.—Before dealing individually with the characteristics of the various shipments, the general features common to all of them may be considered. The wood has three outstanding virtues. It is cheap, durable, and easily worked. The possession of these merits has given it its undisputed pre-eminence in the building world. Its cheapness has been and is remarkable, and the tendency to increase in cost, which must inevitably continue during the next few years, will still leave it an exceedingly economical commodity. When it is remembered that it has to be felled, removed to the shippers' sawmills, cut, shipped, landed, and stored, and is then sold, sawn to merchantable dimensions, at a lower price than any competing home-grown woods, it will be seen that the claim is just and reasonable. Nature's bounty and human industry have combined to place it within our reach at prices and in

quantities which bring it into use for all classes of building work, and its free and unrestricted importation makes it an important factor in the standard of comfort attained in the cottage; while its excellences justify its use for the best constructional work.

A docile wood.—It is a singularly docile wood. It is light, easily worked, and does not develop defects after preparation to so large an extent as most of its more expensive rivals. For ordinary joiners' and carpenters' work, unless some particular decorative effect is required, no substitute need be looked for except where exceptionally large dimensions are necessary. For joinery work it possesses the advantage of a smaller tendency to shrink and warp than most woods. The annular rings being fairly close, it retains its smoothness fairly well after planing, whereas the wood of the American conifers has a marked tendency to develop a waviness or "rib" on its surface, owing to the greater width of the soft or summer wood deposited between the layers of harder material formed during each successive autumn. For satisfactory use in rails, stiles, panels, &c., all it requires is that reasonably mature and well-seasoned planks, deals, or boards be selected, and allowance be made for the fact that no matter how old a deal may be, the application of saw and plane will disturb the grain and cause a further slight shrinkage. There are some woods whose behaviour after the most careful seasoning and preparation causes anxiety to the builder, but in the case of red or yellow deal the most elementary precaution is sufficient. In carpenters' work its toughness and durability make it the commonly specified material for joists, rafters, floorings, &c., its regular

competitors, pitchpine and Oregon or British Columbian pine, coming in where dimensions are required which it does not conveniently yield. In the Midlands and the North, however, it is supplanted for ordinary house building by white deal and spruce, these woods being somewhat cheaper. But in situations which involve exposure to the weather it is superior to either.

It calls for somewhat lengthy treatment in this book on account of its supreme importance to the builder and architect, and the difficult questions which arise round the respective merits of the different shipments. The great variety of purposes to which it is put permits shippers to sort it into five recognised qualities. The area over which it is grown is so large as to allow considerable variations in character. These are compared in detail in chapters.

It will be advisable to lead up to this comparison by considering the defects which the *pinus sylvestris*, in common with other trees, develops in the course of its growth, whether of Russian, Scandinavian, or Prussian origin.

DEFECTS

In any work involving the use of timber, the absence of absolute perfection in the woods of commerce raises the question "What measure, if any, of imperfection, can be legitimately passed or accepted?" It is essential that the architect, contractor, and student should be conversant with the deficiencies continually met with in this material. Practical ability to recognise them, capacity to discriminate between unimportant and serious flaws, and a knowledge of the prevailing commercial standards of excellence are all-important. No

theoretical or botanical knowledge can compensate for inefficiency in this direction. As timber merchants, builders, and architects know to their cost, disputes are continually arising with respect to the suitability of this, that, or the other description of timber for the work in hand. And it is above all the object of this book to supply such information as will assist contending parties to an amicable agreement.

Five defects.—Passing judgment upon timber is really an accurate appraisement of its defects, which may be tabulated as follows:—

I. Rot (Doat or Decay).
II. Sap.
III. Shakes.
IV. Knots.
V. Excrescences (Rindgalls, Tumours, &c.).

Decay.—The recognition of decay in a piece of red or yellow deal is not always so easy as might be imagined. In its advanced stages, whether local or general, it can be identified by the tyro, but in its earlier forms, before its disintegrating effect upon the cells becomes perceptible to the touch, it may only betray itself by colour. Its diagnosis is rendered more difficult by the fact that the soft reddish-pink hue worn by over-ripe or dead wood, though easily distinguished by the joiner, may be confused by the novice with the healthy tint of the duramen or heartwood from the perfectly sound tree. There is a regular business done in admittedly unsound wood, known to the trade as "wrack." But it is honestly sold as such, for purposes where strength or durability are of no account, without any pretence or intent to deceive, and no respectable timber merchant

or builder would consider it for a moment in connection with sale or use for structural work. To do them justice, the much-maligned speculating builders, with whom cheapness is so important a consideration, usually draw the line at "wrack," and it is only a very small minority who entertain it for building purposes.

Its common characteristics are the reddish-pink colour referred to, absence of sap, and presence of cross-shakes. Being usually cut from old and fully-matured trees, it is nearly all heartwood, and very free from both sap and knots. These apparent excellences, if not accompanied by a very high price, are usually grounds for suspicion, and if the absence of any obviously rotten patches or cross shakes leaves any doubt in the inspector's mind, the application of a tool will usually reveal its real character. In this wood the defect is general, or constitutional, rendering the whole piece useless for anything but packing or similar purposes. But there is such a thing as a localised patch of rot or doat, which can be cut away, leaving the surrounding timber quite sound and usable. These are mainly due to the attacks of fungi upon a wound or dead knot left by a broken branch, and a vigorous and healthy tree will possess sufficient vitality to prevent the disease from spreading.

It may be noted in passing that the parallel between the vegetable and animal kingdoms is very apparent in the diseases and injuries to which trees are subject. In their full strength they can prevent an injury from spreading, and if weakly or past their full vigour the products of parasitic growths may set up chemical changes in their juices which eventually destroy them

altogether. The local injuries referred to usually cause the decayed area to assume a very much darker colour than that exhibited by "wrack," and to show a more complete degeneration of the tissues.

Dry-rot.—Another form of decay to which timber is subject is "dry-rot." This is rarely or never seen in the imported wood as it is received by the merchant or builder. It requires for its development conditions which do not exist until the material is fixed, viz.: damp, absence of ventilation, the presence of a certain specific fungus, and an unseasoned state of the wood itself. When all these are present, wood which was merely "fresh" when put into a building, and bore no sign of incipient decay, will degenerate into a soft cheesy pulp, bearing upon any face not exposed to light a cob-webby felt-like growth, sometimes attaining to enormous dimensions. It spreads rapidly, and will speedily affect the timbers of an entire house. Its avoidance is not so much a matter of careful inspection before use, as in the other cases referred to, as of avoiding the use of fresh unseasoned wood in moist, unventilated situations.

Sap.—The defect in all forms of timber, and particularly in softwoods, about which most of the controversies rage, is sap. Decay is a thing which admits of no possible toleration in structural timbers, the only question for decision being whether it exists or not. But sap is a debatable affair, its existence, within certain limited proportions, being frequently permitted in red or yellow deal for building purposes. To obtain a clear sense of proportion in judging the right of sapwood to recognition as usable, it will be necessary to consider very briefly the part it plays in the growth of the tree.

If a transverse section of a typical mature "*Pinus sylvestris*" be examined, it will be found that where the diameter of the tree is, for example, 20in., there will be from 90 to 120 double concentric rings. Each double ring represents the wood added in a year's growth, the lighter, softer ring being the wood added during summer, and the darker, harder ring being the autumn growth. Counting from the centre there will be about 50 to 70 double rings of "heartwood" (duramen), and the remaining rings will form a belt of sapwood (alburnum). The sapwood lacks the warm yellowish pink colour of the heartwood, and is readily distinguishable from it. It is really the seat of the circulatory system of the tree, being the medium through which its juices ascend and descend; and is admittedly less durable than the heartwood. It must be remembered, however, that the tracheids, or elongated cells, of which it is mainly composed, are structurally identical with those in the heartwood. The latter does not solidify in coniferous trees, as some suppose, when it ceases to perform the function of carrying the sap. If the tree is felled during the summer, when the sap is actively circulating, the presence of moisture with chemical elements in solution renders the sapwood an easy prey to the attacks of fungi and predisposes it to early decay. But if the tree is felled in winter, when dormant, the outer rings approximate more nearly in condition to the duramen, and the wood they contain is not without a certain measure of strength and durability.

Fortunately, external indications show quite clearly whether the tree has been cut down at the right time and its contents properly treated. If the chemical consti-

tuents of the trees' juices are actually present in the tracheids, the sapwood in the sawn plank, deal, or board shows a distinct blue or green tint, and is identified as unfit for use. Otherwise, the sapwood retains its colourless appearance, and is known to the timber merchant as "bright."

It being agreed that discoloured sapwood must be avoided, the question then arises, "What proportion of 'bright sap,' if any, may be used for constructional work?" The question is at the bottom one of economy. The description just given of a typical transverse section shows that in the mature tree of average growth the area of duramen or heartwood is little more than half, the smaller number of rings in the sapwood being discounted by their being of greater circumference. The rectangle sawn from the inner area of heartwood involves a further reduction, if none of its angles are to show any sapwood. Thus, the conversion of perfectly sap-free scantlings enormously reduces the yield of the tree. It is quite conceivable that there is a class of work in which, cost being a matter of indifference, absolute freedom from sapwood may legitimately be insisted upon. But when it is understood that the difference in cost between perfectly sap-free timbers and those in which a reasonable percentage of bright sapwood is allowed may easily amount to 100 per cent. or more, there will be less likelihood of uncompromising insistence on the former.

The crux of the difficulty lies in this fact, that while the circumference of the heart area is approximately circular, the joists and other timbers used in building and similar work are right-angled parallelograms, and

the avoidance of sap at the corners implies the cutting away of heartwood as well. So that it is distinctly more economical to specify a slightly larger size than is required, the inclusion of sapwood at the corners being compensated for by the extra heartwood.

It is only fair, also, to give bright seasoned sapwood credit for a certain amount of stress-bearing capacity, even allowing for a relative inferiority as compared with the heart. But the point of the argument is that even if the former be regarded as quite valueless, its inclusion carries with it, without extra cost, a certain amount of additional heartwood. This is recognised in practical work, as an examination of the wood used in all kinds of building operations will show. But it is not recognised "on paper," as will be seen in the wording of the clauses under which contractors carry out their work.

Some of the Government specifications issued by departments which are regularly dealing with timber permit the inclusion of a percentage of sapwood for certain purposes. Practical architects admit it, the latitude they allow varying with the character of the work and the resources of their clients. What is wanted, therefore, is not so much a reduction of the prevailing standard as a correction of the existing notion that the presence of sap in a building scantling is, *ipso facto*, evidence of shoddy work or carelessness on the part of either contractor or architect.

Sap formula suggested.—The sizes specified for constructional work are compromises, based upon a mixture of mathematical formulæ and precedent. Precedent permits the inclusion of a percentage of sapwood;

but precept forbids it. If the architectural profession and the building trades jointly seek a formula to justify its use, the following may suffice:—

"A 3 × 9 showing an inch of sap on each edge will cost no more than a 3 × 7 absolutely sap free, and it will contain more heartwood."

A recognition of this fact will make for greater accuracy in specifications, and remove a fruitful source of misunderstanding.

So far as joinery is concerned, everything depends upon position, prominence, and finish. Painted work naturally does not demand the same standard as a clear varnished surface. A clear understanding of the factors already set forth will make for harmony in this connection, as well as on the structural side.

SHAKES.

The conversion and use of red fir for building purposes, besides being complicated by the existence of sapwood, is made more difficult by the presence of four distinct kinds of shakes (cracks or clefts), viz., ring or cup, star, heart, and cross-shakes.

Ring or cup shake.—As the words imply, the ring or cup shake is a division between the annual rings. When it forms a complete circle, going entirely round the tree, it of course encloses a completely separated column or cone of wood, seriously reducing the strength of the scantling in which it occurs. It does not develop in the converted scantling, being attributable to various influences acting upon the standing tree, such as frost, the mechanical effect of swaying caused by strong winds, forest fires, or the attacks of fungi.

Star shake.—The nature of the star shake is also indicated by its name, the fissures extending across the annual rings from the centre towards the circumference, widening as they approach the outside of the tree. This is the defect which develops most in the ordinary course of seasoning, the outer rings parting with their moisture earlier and shrinking more than the inner. It is interesting to observe that this shake follows the course of the pith-rays which exist, imperceptibly to the naked eye, in the conifers, corresponding to the very noticeable rays (frequently known as "silver grain"), which produce the figure in oak.

Heart shake.—The heart shake differs from the star shake in the fact that it is widest at the centre, diminishing as it nears the outer layers. While its presence is not actually a sign of decay, it is an indication that the tree before being felled had passed its prime, failing vitality showing itself in a deterioration of the central tissues.

Cross shake is not met with in healthy timber, and shippers do not export cut stuff showing this defect in any but the "inferior" or "wrack" grades, so that it is not likely to be seen in stocks intended for structural purposes. Whatever may be said as to the passing of the other forms of shake, this, of course, is a prohibitive defect.

What to avoid.—Referring to the cup, star, and heart shakes, it would appear desirable to avoid the use of any timber containing them. But this is simply counsel of perfection. In one form or other, shakes appear in nine-tenths of our imports of softwoods, and

the question, commercially considered, is to what extent they are to be tolerated.

A moment's consideration of the formation of trees and the mechanical action of seasoning will demonstrate that they are practically inevitable.

What to permit.—It is quite impossible to lay down in a work of this kind the exact standard to apply. For external surfaces in joinery work they must, of course, be avoided at all costs. Perhaps a completely "boxed in" ring or cup shake may pass in a solid frame. In this matter the class of work and the question of cost must be considered.

With reference to weight-bearing timbers, only experience will permit the formation of a sound judgment as to the extent to which a number of small shakes will affect the strength of a scantling. A good but quickly dried plank may show a large number of small and shallow surface shakes which will have little or no effect upon its stability, an examination of the ends, as well as the surfaces, being very necessary in this case.

The selection of timber is largely a matter of choice between defects. Young timber is less shaky than that cut from mature trees, and such shipments of joiners' deals as are to be met with in the stocks of to-day usually err in the direction of sappiness when very sound.

Red deal is more prone to shake than white, and the increasing difficulty of obtaining perfectly sound and sap-free deals and planks in the former wood is likely to develop the substitution of the latter in the near future.

Here, as in other parts of this work, it is necessary to run the risk of appearing to set up a low standard by adjuring inspectors, in judging this wood, to bear in

mind the enormous reduction in the proportion of first-class wood now available as compared with the past.

Importers are continually bewailing the inability of shippers to meet their requirements in connection with best quality planks, deals, battens, and boards. Pending the establishment of economical means of communication with forests at present inaccessible, they have to make the best of available resources.

KNOTS.

The economic processes which have produced an increase in the sapwood shown by the red fir of to-day have brought about a corresponding increase in the number of knots. One sees large live and small dead knots included in planks, deals, battens, and boards bearing quite high-class brands.

Dead and live knots.—The extent to which knots impair the suitability of a piece of timber for building work depends on many factors. A very large dead knot is, of course, a serious fault. The word "dead" implies that the branch which sprung from it had died, leaving it without life in its tissues, and without real union with the surrounding trunk wood. Besides reducing the bearing strength of the scantling, it is liable to drop out altogether. A large live knot, *i.e.*, the root of what was a living branch when the tree was felled, will be found very hard and practically inseparable from the wood in which it is embedded. Unless they are unusually large and numerous, therefore, they are not regarded as prohibitive defects in carcassing timbers.

Some shipments exhibit a large number of small "pin-knots," admittedly dead, but too minute to enter

into stress-resisting calculations. These may be passed for constructional work, but of course require consideration from a different point of view where the wood is to be used for joinery.

Small live knots may be allowed on visible surfaces, but even the smallest dead knots constitute a disfigurement. Then a great deal depends upon the finish to be given to the material. Paint, like charity, will cover a multitude of sins, while clear varnishing will accentuate them.

The conclusion seems to be that where work is of a sufficiently high-class character to demand freedom from knots red fir must not be specified. Or, to put it another way, if the extra expense involved by the use of cleaner and dearer woods is objected to, clients cannot expect their architects to obtain joinery and carcassing stuff showing large surfaces free from knots, the wood being practically unobtainable.

Rindgalls.—Allied to knots are occasional minor defects, usually known as rindgalls. They consist of wounds inflicted on the living tree by various agencies. They may be the result of burns, blows, or the attacks of insects. They are usually strictly localised. If serious, the careful contractor will cut them out. But they may be quite small and negligible, having been surrounded by the tissues of the growing tree, and merely showing as patches of discoloured and irregular-grained wood.

VARIETIES COMPARED.

The first thing that strikes the student in connection with the places of origin of this wood is the enormous area covered by the forests now being worked, and the

consequent difference in the character of the various shipments, due to variations in soil and climate.

It is imported from Russia (including Finland), Sweden, Norway, and Germany, and the wood from each country possesses characteristics which differentiate it from the product of the others. Before making detailed comparisons, however, it is necessary to point out a mistake which is commonly made in this connection. It is erroneously supposed that, because the wood of a certain shipment from one particular country is generally held in high esteem, it is always good, and its competitors are always inferior to it. Sometimes a good parcel of a particular brand so strikes the fancy of an architect or contractor that he makes a fetish of it, making needless efforts to secure it when there are plenty of equally good stocks of other descriptions more conveniently obtainable. It should be understood that although the exports from various shipping districts each have their own features, easily recognisable by the expert, we receive good, bad, and indifferent from all quarters. Condition and average quality fluctuate considerably, and it is impossible to say that the output of any one shipper or any one port is always superior to its competitors.

Trees differ.—The differences between individual trees growing in any one forest are just as marked as the distinctions existing between human beings of any one race. The skill of the converters at the mills, the methods of the sorters, and the conditions under which cargoes are shipped are all variable quantities. In fact, it is often said in the timber trade that when one particular output has been very good for two successive seasons it is

not unwise to avoid it for the third. These points are emphasized to prevent the injudicious placing of any one variety on a pedestal, or the equally unwise prohibition of the use of others which may not in the past have enjoyed so excellent a reputation.

Merit v. brand.—Timber should be judged on its merits, irrespective of its brands; and while it is right enough to name a certain well-known production as a standard, the words "or equal thereto" require to be added. Sometimes a shipper's entire output will be sold to continental or other distant buyers, and its distinguishing mark will be absent for a season. Merchants' stocks are continually changing, and even the biggest importers are often quite unable to supply certain specified shipments just when they are asked for. It does not follow that this invalidates a knowledge of the broad distinctions which exist. But its appreciation will prevent the application of needlessly narrow limits to the margin which an architect may reasonably allow to the contractor who is carrying out his work.

Summary of characteristics.—The four countries named as places of origin are dealt with in detail in the succeeding chapters. But if a concise summary of the character of their productions is looked for, it may be condensed as follows:—

Norwegian stuff, though sound and tough, is small, and rarely imported in dimensions large enough for architectural or engineering work. German is largely placed out of court by the comparative smallness of the quantity, and the fact that it takes the form of log stuff only, sawn planks, deals, or boards being absent, except at rare intervals. Russia and

Sweden practically monopolise the supply of red fir as used for contracting, and it is quite impossible to say that the one or the other is the better, the enormous variety of grades and brands defying comparison. For practical purposes it is enough to say that the best from one country is just about equivalent to the best from the other.

CHAPTER III.

RED or YELLOW DEAL (*continued*).

RUSSIAN.

The exports of this wood from Russia may be roughly divided into three classes—Archangel, Petersburg, and Riga. Each of these names covers a number of loading ports, on the borders of the White Sea and the Gulf of Finland respectively. In so far as it is possible to make a broad and general distinction between the two first-named varieties, it may be said that the Archangel district yields wood of a milder and more easily-working character, and Petersburg of a tougher nature. Each of these features is advantageous or otherwise according to the purpose for which the wood is designed. For interior joinery, where kindness under the tool, avoidance of warping, and smoothness of finish are desirable, there is nothing better than the higher qualities in White Sea stuff. For structural purposes, where toughness and durability are necessary, the better-class Petersburg wood is excelled by none, and only equalled by good Swedish shipments. This, of course, is only a generalisation, referring to general average, for plenty of excellent timbering material comes from the Archangel ports, and very good joiners' wood from Petersburg. In some of the smaller British importing centres the general

usefulness and somewhat lower average price of the latter secure preference for it over the more northerly district. But in London, where much of the work demands the best that money will buy, the excellence of the first and second qualities in White Sea stuff make it the favourite for all kinds of joinery.

White Sea supremacy disputed.—There are some who dispute the supremacy of White Sea fir, contending that the qualities which appeal to the workman in converting it are not consistent with the best results in the way of durability. Some carpenters speak of it as "Onega pine," the mildest deals resembling Quebec yellow pine in their softness under the plane. If it were possible to hold the necessary varieties of stocks, the ideal combination, so far as Russian stuff is concerned, would be Petersburg wood for outside doors and Archangel for inside. The Archangel deals and planks probably shake less in seasoning than Petersburg, while thin panel boards in the former wood, if "sticked" to dry in long lengths, would retain their straightness to a greater extent than the latter. At the same time the best Petersburg brands, when carefully and slowly seasoned, though involving a little more labour in preparing, yield excellent results.

Heart and sapwood.—The difference in colour between heart and sapwood is perhaps more marked in Petersburg than Archangel, the former variety showing a pronounced reddish colour more often than the latter, the heartwood of which is of a yellower tint. The absence of paint quality marks is a notable feature of Archangel and Petersburg shipments, the shippers' brands being hammer-stamped on the ends with a die.

Quality marks differ.—It is to be regretted that the shippers differ so widely in their procedure regarding quality marks. Some stamp their best qualities with a figure 1 on the ends, their seconds with a 2, and so on. Others indicate the differences in quality by varying the initials on the dies. Others show it by a coloured chalk figure on the flat or edge, and some do not mark their thirds at all. Sometimes a number stamped on the ends will not refer to quality at all, but serve to identify some particular bill-of-lading. The net result is that identification of quality by marks is not easy, and acceptance or rejection should never be based on that factor alone.

Archangel shipments are sorted into firsts, seconds, thirds, and fourths, and Petersburg into firsts, seconds, and thirds. Archangel firsts and seconds and Petersburg firsts are imported solely for good-class joinery. For ordinary work Archangel thirds and Petersburg seconds will yield a considerable proportion of joiners' stuff. Archangel fourths will contain more shakes, and Petersburg thirds more sap. Both these qualities, although guilty of sap, shakes, and large knots, are free from doat or cross-shakes. They find ready acceptance for many purposes, but we think that while the best parcels of fourths from Archangel may contain a certain amount of carcassing stuff, architects are justified in preferring the competing grades of Swedish or Finnish wood for structural purposes in decent contract work.

Petersburg and Archangel fir is of slightly longer average than Swedish. It is almost exclusively shipped sawn. A few hewn logs are exported from Archangel, and one or two mills at Riga send planed boards, but

these are mere trifles in comparison with the sawn planks, deals, battens, scantlings, and boards which form the great bulk of the Russian product. During the last few years the White Sea shippers have utilised what would otherwise have been waste by sending large quantities of moulding strips, of very small sizes, $\frac{3}{4}$in. to 1$\frac{1}{2}$in. thick by $\frac{3}{4}$in. to 4in. wide. Large quantities of scaffold poles are exported from Petersburg.

Riga sends us sawn planks, deals, battens, and boards, with some hewn logs. The wood is not nearly so close grained as the Petersburg or Archangel stuff. It does not come into serious competition with the latter imports for contract work. It is sound and strong, but is mostly shipped "unsorted," with a percentage of waney edges, and the bulk of it is absorbed in ordinary house-building.

SOME REPRESENTATIVE BRANDS (Russian).

ARCHANGEL District.

Firsts	C S^1	Hammer stamped on ends.
Seconds	C S^2	
Thirds	C S^3	
Fourths	C S^4	
Firsts	I / W	Hammer stamped on ends.
Seconds	II / W	
Thirds	III / W	
Fourths	IV / W	
Firsts	O W C	Hammer stamped on ends. I. in chalk on flat
Seconds	O W C	" II. "
Thirds	O W C	" III. "
Fourths	O W C	" IV. "

Firsts	B B 1	Hammer stamped on ends.
Seconds	B B 2	
Thirds	B B 3	
Fourths	B B 4	

Firsts	E F 1	Hammer stamped on ends.
Seconds	E F 2	
Thirds	E F 3	
Fourths	E F	

PETERSBURG.

Firsts	E H B & Co. 1	Hammer stamped on ends.
Seconds	E H B & Co. II.	
Thirds	E H B & Co. III.	
Unsorted	E H B & Co.	

Firsts	MG&CO	Hammer stamped on ends.
Seconds	M G & CO 2	
Thirds	T.G. III.	

Firsts	GRoMoFF	Hammer stamped on ends.
Seconds	GRoMoFF	
Thirds	Unmarked	

Firsts	O S	Hammer stamped on ends.
Seconds	O S	
Thirds	Unmarked	

Firsts 

Seconds E R
II.

Thirds I

} Hammer stamped on ends.

Riga.

Marked in paint. Not offered for contract work so frequently as to warrant quotation of marks.

Notes on Russian brands.—All except Riga, hammer stamped. Crown marks, where used at all, confined to first qualities in Petersburg and White Sea shipments.

Important.—The foregoing brands are only a selection from large numbers of first-class shipments. They are merely put forward as typical and representative examples.

CHAPTER IV.

RED or YELLOW DEAL (*continued*).

FINNISH.

Although politically Russian, Finland exports a sufficient volume of timber to merit separate consideration. Its entire coastline is studded with loading places. The shipping districts are numerous, their names (starting from the extreme North) being Kemi, Uleaborg, Brahestad, Gamla Karleby, Jacobstad, Nye Karleby, Wasa, Christinestad, Bjorneborg, Raumo, Nystad, Abo, Lappvik, Helsingfors, Borga, Lovisa, Kotka, Fredrikshamn, and Wyburg.

The mills resemble their Russian neighbours in exporting sawn planks, deals, &c., to the practical exclusion of planed wood and log stuff. The shippers brand their product with paint marks, in this respect differing from the Archangel and Petersburg district firms. A very large proportion of their output is unsorted. They send a larger percentage of small batten and scantling sizes than the Russian exporters, and their output is popular with the merchants whose trade lies mainly with housebuilding of the usual character. The forests do not yield a big percentage of very large trees, such as are needed for the production of best quality joinery stuff, so that in most cases it pays the shippers to cater more particularly for the medium-class trade. There are exceptions, though. Two of the largest shippers,

having access to the best of the raw material, sort their production into firsts, seconds, thirds, and fourths, and their higher qualities make excellent joinery, the thirds making very good carcassing and timbering material.

The export from Finland includes large quantities of useful stuff of small dimensions, such as 2in. scantlings, roof boards, feather-edge boards, slating battens, tiling laths, &c.

SOME REPRESENTATIVE BRANDS (Finnish).

Bjorneborg.

Firsts	B S 1st S C	In paint.
Seconds	B S 2 S C	
Thirds	W R C	
Fourths	B W C	

Rafso.

Firsts	R F 1st S O	In paint.
Seconds	R F S O	
Thirds	R A F S O	
Fourths	W B W	
Unsorted	W A W	

Wyburg and Kotka.

Firsts	H ♕ Co.	In paint.
Seconds	H + Co.	
Thirds	H — Co.	
Unsorted	H · Co.	

Kemi.

Firsts and Seconds K E M I In paint.

Uleaborg.

Firsts and Seconds T O P L A In paint.

Kotka.

Unsorted, W G + R In paint.

Notes on Finnish brands.—All in paint. Blue or black paint usually indicates the discoloured and/or inferior sortings. Crown marks not confined to firsts. "Unsorted" and "first and second" are more or less interchangeable expressions, "first and second" usually being the equivalent of a good unsorted.

Important.—The foregoing brands are only a selection from hundreds of first-class shipments. They are merely put forward as typical and representative examples.

CHAPTER V.

RED or YELLOW DEAL (*continued*).

SWEDISH.

A very large proportion of the red fir consumed in the United Kingdom comes from Sweden. As the supply of prime logs from Danzig and Memel gave place to the import of smaller sawn dimensions, Sweden was only competed with by Petersburg for a time, and during the "eighties" the position of the leading Swedish stocks was unchallenged. During the last 20 years the White Sea has become an increasingly dangerous competitor, but they still bulk largely in our imports.

The difference in character between the Russian and Swedish material is perhaps best defined by a reference to the constitution of the annular rings. The lighter band of summer wood to be observed between the darker and harder rings of autumn-grown substance is perhaps softer in the Russian than in the Swedish trees. Or, to put it another way, the difference in hardness between the summer and autumn wood is not so marked in the latter as in the former. Some conclude from this that Swedish deals are better for joists or weight-bearing work than their Archangel or Petersburg competitors. The same circumstance will account for the opinion held by many that Swedish joiners' stuff costs a little more for labour in working up than the Russian, and that it will retain its smoothness after leaving the plane for a longer time. The best Swedish brands show a little

more sap, perhaps, than the best Archangel, and may have a larger percentage of centres.* Even where the Swedish firsts fall a little short in these respects, however, they are to be commended for their comparative freedom from knots, and for some purposes the presence of clean, perfectly-seasoned sapwood may be pardoned when the deal or plank will yield a good length almost entirely free from knots.

Shakes.—The shake in a Swedish deal is more likely to run at right angles (or nearly so) to the surface than in the Archangel wood, which is more apt to exhibit a "shelly" shake running almost parallel to the face, leaving a thin tongue or wedge that easily peels off. This illustrates how difficult it is to say that this or that shipment is "better" than another, everything depending on the work for which the stuff is used. A shelly Archangel 3 by 9 may yield a perfectly sound 2 by 9. The perpendicular shake running nearly through a Swedish deal may render it useless for that particular form of conversion, while leaving it open for uses which the other would not suit.

The Swedish mills yield a large percentage of good timbering wood, being very free from soft and spongy fibre. A Swedish deal of the same market value as a standard Archangel fourth will be sounder, but more knotty. It will show some sap, but though less mild and clean it will probably prove more tough and durable.

Branding methods.—It is necessary to

* The above comparison between the best Swedish and Archangel shipments refers to the average productions, and it should be said that one or two of the Swedish shippers export a small quantity of very high-grade deals superior in freedom from defect to anything else on the market. These are eagerly competed for, as the output is strictly limited.

emphasize the fact that the nominal quality in the lower grades of red fir often fails to do justice to the material. The Swedish shippers sort their output in two ways. They divide it into 1sts, 2nds, 3rds, and 4ths, with a fifth quality admittedly containing defects which put it out of court for contract work. Some of them have an alternative method, making two usable and reputable grades, viz., firsts (containing 1sts and 2nds), and seconds (containing 3rds and 4ths). So that we may have 2nds of the same market value and quality as 3rds and 4ths from the same port. An architect unfamiliar with the timber trade may therefore hesitate to use a brand listed as thirds, on the not unnatural assumption that a grade with two qualities above it must be inferior. Certainly he would object to third quality bricks, or third quality tiles. In fact there are few commodities in which the label "thirds" or "fourths" would not arouse suspicion.

Good thirds.—When it is explained, however, that a "third" may have two qualities below it, and that the firsts and seconds are specially selected for virtues which are not called for in carcassing material, the case is altered. When, in addition, it is explained that "unsorted" often means only what is left after the joiner's stuff on the one hand, and the cross-shaken or doated wood on the other, have been taken out—and that one man's seconds may be no better than another's thirds and fourths, it will be seen that the nominal quality is a deceptive guide. These circumstances will account for the desire usually found to prevail in the timber merchant's mind, that his stock shall be judged on its merits, irrespective of its label.

Many shipping districts.—The Swedish shipping districts are numerous. Commencing at the North, they are: Haparanda, Lulea, Pitea, Skelleftea, Umea, Ornskjoldvik, Hernosand, Sundswall, Hudikswall, Soderham, Gefle, and Gothenburg. The favourite shipments come from the Sundswall, Hudikswall, Soderham, and Gefle districts, which draw their supplies from the finest of the Swedish forests. This does not imply that good stuff is not obtainable from the other areas, but the class of timber from the districts named is usually of a somewhat higher average quality and value.

The Swedish mills turn out large quantities of planed boards, matchings, and floorings. As a rule the finish required on planed surfaces involves the preparation of joiners' stuff by the contractor, but the imported 9in. and 11in. planed boards can be usefully and economically applied to many purposes in ordinary work. Floorings and matchings are treated separately in a succeeding chapter. A few hewn logs are exported, but their size and quality do not commend them for conversion in contract work. This form of import, so far as the United Kingdom is concerned, is practically obsolete. Small hewn stuff, known as die-square or balk, from 5in. to 8in. square, is imported from Sweden, mainly for use in scaffolding, trenching, &c.

SOME REPRESENTATIVE BRANDS (Swedish).

From Holmsund.	Firsts	H ♔ D	In paint.
	Seconds	H D D	
	Thirds	H N D	
	Fourths	H F D	
	Unsorted	H S U N D	

	Firsts	S ♕ D	In paint.
	Seconds	S D D	
	Thirds	D ✱ S	
	Fourths	S + K	
	Unsorted	S W K	
Sundswall district.	Firsts	S ♕ B	In paint.
	Seconds	S B S	
	Thirds	S A B	
	Fourths	S S S	
	Unsorted	S U B	
	Firsts	E ♕ E	In paint.
	Seconds	E E E	
	Thirds	J A E	
	Fourths	K K K	
	Unsorted	A + E	
Hudikswall district.	Firsts	H ♕ H	In paint.
	Seconds	H ✱ H	
	Thirds	H H H	
	Fourths	ꟻ H B	
	Unsorted	+ H H +	
Soderhamn district.	Firsts	W W B	In paint.
	Seconds	W S W	
	Thirds	W T W	
	Fourths	W F W	
	Unsorted	W O W	
	Firsts	M A R M A	In paint.
	Seconds	M B	
	Thirds	M A B	
	Fourths	S M S	
	Unsorted	U M S	
	Firsts	O ♕ W	In paint.
	Seconds	I W L	
	Thirds	E W L	
	Fourths	A W L	
	Unsorted	O W L	

Soderhamn district—*cont.*	Firsts	B S S C	In paint.
	Seconds	B C	
	Thirds	B B B	
	Fourths	↑↑↑	
	Unsorted	B—Co.	
Gefle District.	Firsts	K H B	In paint.
	Seconds	H A B	
	Thirds	♔ ♔ ♔	
	Fourths	♔ HK ♔	
	Unsorted	A ♔ W	
	Firsts	S K B	In paint.
	Seconds	D O M	
	Thirds	D M	
	Fourths	D * M	
	Firsts	K A B	In paint.
	Seconds	N A S	
	Thirds	* * *	
	Fourths	* *	
	Unsorted	K ♔ B	

Notes on Swedish brands.—All in paint. Sometimes firsts and seconds from various Swedish ports are combined and called firsts and the thirds and fourths are combined and called seconds.

The system of sorting represented by the above brands is a severe one, as it describes what is really first-quality carcassing stuff as "thirds," the firsts and seconds being strictly joiners' wood.

Important.—The foregoing brands are only a selection from hundreds of first-class shipments. They are merely put forward as typical and representative examples.

CHAPTER VI.

RED or YELLOW DEAL (*continued*).

NORWEGIAN.

Norway exports this wood in the form of sawn scantlings and battens, and planed boards, including floorings and matchings. We used to receive bigger stuff, up to 3 by 9, and 3 by 11, and Christiania red is sometimes specified to-day, in ignorance of prevailing conditions. But the forests do not now yield sufficient mature wood of these dimensions to permit of its regular supply, and it is a long time since Christiania deals were obtainable in the United Kingdom.

Special catering. — Norwegian mills cater specially for the supply of planed goods as used in ordinary house building, and send large quantities of ¾in., ⅞in., and 1in. floorings, with matchings of the usual dimensions. They are sorted into 1sts, 2nds, and 3rds, but many shippers sell them "as falling," or unsorted. The first quality of the best shipments is very good, and suitable for any work. The scantlings are cut from small trees, and are not always square edged, the purposes for which they are used permitting a certain amount of wane; but the wood is sound and tough.

Christiania shares with Petersburg the trade in scaffold poles. Norwegian timber is not offered for contract work so frequently as to warrant quotation of marks, except in the case of floorings (pp. 56/57).

CHAPTER VII.

RED or YELLOW DEAL (*continued*).

DANTZIC AND MEMEL.

In books dealing with timber which were published over 30 years ago, Memel and Dantzic fir looms very large.

Before the trade in sawn deals, &c., developed in the United Kingdom, vast quantities of logs were imported from Memel, Dantzic, and Riga. They yielded very fine, clean, mature wood, and as the conversion was performed by the consumers the numerous questions which now arise respecting brands and qualities gave less trouble. Certainly it was excellent material, very durable, and afforded every satisfaction for both joinery and constructional purposes. But the competition of the sawn wood from Sweden and Russia, combined with the natural depletion of the best and most accessible forests in Germany, has diminished the trade in it to vanishing point. For carcassing sizes up to 4 by 12, it has been ousted by the Swedish and Russian fir, and for larger dimensions, requiring to be cut from logs, pitch-pine and Oregon or British Columbian pine have succeeded it.

Out of date.—Neither Memel nor Dantzic has catered for the newer form of trading. We receive a few small consignments in the way of hewn fir logs from the latter port, but neither in size nor quality do they

rank with the good timber which earned these districts their reputation in the past; and the stocks of a dozen merchants might be ransacked without coming across them. We get a little from Riga, but this is now of a coarse and spongy character. While, therefore, it is impossible to say that the wood is absolutely unobtainable, there is no longer any purpose to be served by specifying it.

The Government still buys sawn wood from Memel in the shape of deck deals, but they do not come on the market for ordinary purposes. When prices of Swedish and Russian stuff rise sufficiently high, Memel shippers are enabled to export sawn unsorted deals and planks of fair quality, but the supply is desultory.

Obsolete terms.—Architects' specifications frequently set forth a demand for "Memel, Dantzic, or Riga fir" in the clauses governing timber for carpenters' work, but the formula is usually regarded as a dead letter. It is considered to be a mere copy of obsolete clauses dating back a quarter of a century. The substitutes of to-day, if not in all cases quite the equal of the best fir of 30 years ago, are at anyrate equal in quality and superior in economy to the fir now exported from these ports, and the custom of the trade is to ignore the wording of such clauses as we have referred to, and supply the up-to-date forms without comment or apology.

Architects who retain a strong preference for the Prussian fir and specify it of set purpose will find that constructional scantlings which would otherwise cost about 2s. per cubic foot will run into 3s. 6d. or 4s., without any corresponding improvement in quality.

CHAPTER VIII.

RED or YELLOW DEAL (*continued*).

FLOORINGS.

The quantity of red or yellow deal consumed for floorings is so large that this particular form of it demands a chapter to itself. Many of the differences which arise between architects and builders with respect to wood centre round the question of quality in floor boards.

Fir, or, as it is more commonly called in this connection, deal, is so much cheaper than its competitors that architects, in deference to their clients' desire for economy, sometimes specify it where perhaps the general character of the building calls for a block floor, or for pitchpine, oak, maple, or teak. It is only natural that architects should look with a critical eye upon the material supplied by the builder for this purpose, it being the one kind of woodwork which is open to the inspection and criticism of all and sundry, and which has no friendly covering of paint or varnish to cover its defects. When, therefore, the contractor sends on to the job the best quality that the merchants import, and the architect perceives that it has defects in the form of knots and sap, a very difficult situation arises. The builder feels that he has done all that is possible by procuring the best obtainable stuff, and the architect is just as genuinely dissatisfied with its appearance. It is to be hoped that a careful study of the facts, as herein

set forth, will help to prevent the recurrence of such difficulties.

Flooring is imported from Sweden and Norway. The Norwegian stuff is rarely shipped in 1¼in. or 1½in., being mainly confined to ⅞in. and 1in. (nominal), and therefore does not usually enter into the builder's calculations for expensive contract work. Still, it is quite sound, and is good value for cottage and small suburban villa work, the firsts and seconds being quite square-edged, bright, and well prepared. The thirds are popular with speculative builders, and, though showing a trifle of wane on the under-side, are quite free from shakes or doat. The largest shipping ports are Fredrikshald, Christiania, and Drammen. Although, as already stated, the goods are not largely offered for contract work, the best qualities from these ports should be quite suitable for any floor for which deal is specified. The Swedish shippers export large quantities of plain edged and tongued and grooved floorings, 1in. and 1¼in. (nominal) thick, with a smaller percentage of 1½in. The output of the recognised standard stocks is sound, free from wane (with the occasional exception of a small percentage in the thirds), and well prepared. It is sorted by some shippers into firsts, seconds, and thirds, and by others into extra firsts, firsts, and seconds. This divergence in practice again illustrates the danger of judging the material solely by its nominal quality, as the expression "extra first" does not imply perfection, and some of the best shippers' firsts are as good as others' extra firsts. For example, the H S ♔ N D brand, which has no superior, is content to be listed merely as "firsts."

What are firsts?—It is not giving away any

trade secret, neither will it excite the resentment of the conscientious merchant, when it is suggested that a legitimate question to ask, where a merchant is offering "firsts," would be: "Does the shipper of these firsts send an 'extra first' quality above them?" In describing the firsts and extra firsts of the recognised brands, it must be admitted that the best of them are disappointing to the man whose lack of experience causes him to base his expectations on their titles alone. They will be found perfectly sharp-edged, well thicknessed, quite free from large or loose knots and discoloured sap. But they will show either a proportion of quite bright sap, or some small knots, or both.

Defects.—If architects or consumers complain that the presence of these defects is not consistent with the official grade, the shippers and merchants reply: "These represent less than 20 per cent. of the total quantity as falling from the plane. From a given outturn of boards over 80 per cent. are marked and sold as seconds and thirds, or, if an 'extra first' is made, as firsts and seconds. This trifling proportion—sometimes falling as low as 5 per cent. to 10 per cent. of the whole—represents the best that the trees will yield." The obvious rejoinder to this is that surely the trees remaining in the forests accessible to-day are not so small and immature that they will not yield boards 5in. to 7in. wide without sap and knots. Then the shipper explains that the demand for better flooring is accompanied by an equally important demand for better deals, and he has to convert the trees in such a way as to meet all requirements. Obviously wood which would make a good joiner's deal or plank is not likely to be converted, at a greater cost

for labour, into boards which would have to be sold at a loss. For if a shipper, disregarding waste, manufactures a limited quantity of absolutely perfect boards, he destroys his own market. He would have to ask so high a price that the consumer would use something else, such as pitchpine.

As in most of such controversies, it is usually found that the shipper on the spot knows his business best, and makes the best possible use of nature's resources; and it is only our ignorance of his insurmountable difficulties that leads us to expect of him more than he can perform. Very often a proffered parcel is refused because the receiver cannot help supposing that there must be something better available, when really money will not buy it. It is to be hoped that these remarks will account in some measure for the faults which undoubtedly exist in even the choicest and most expensive shipments.

Defects tolerated.—It is not within the province of this work to say whether the presence of some knots and sap is or is not to be tolerated for good-class building; but it may be said that where resources permit, and where the character of the contract demands knot-free heartwood exclusively, some other wood must be used. Sometimes the difficulty is minimised by specifying and using home-prepared flooring, made from imported unplaned boards or deals. But this is expensive, a very slightly higher grade of flooring involving an addition to the cost out of all proportion to the result. First and second Archangel boards, which are usually taken for this purpose, will make a very showy floor, but even then a modicum of defect will be visible, and the softness and mildness of the wood, which is its

recommendation for joinery, is against it for this specific purpose. If firsts are used they will cost as much as pitchpine, which is easily procurable in a quality practically free from either of the defects named. All this is said, not to discourage the use of deal flooring, but to assist in a just appraisement of its position. The next grade to the extra first and first, known as first or second, according to the system of the shipper, is quite square edged, just as sound and well thicknessed as the top quality, and will be quite free from discoloured sap. There may be a little more bright sap, and the knots will be larger and more numerous. It is free from doat or shakes, and is very economical, making the cheapest possible floor—using the word cheapest as representing a combination of moderate price, soundness, and durability.

Ports of shipment.—The ports of shipment are the same as those given in the earlier chapter which deals generally with Swedish red fir, with the reservation that some of the shippers, especially in the North of Sweden, do not send planed goods, confining themselves to the sawn wood.

The merits of other woods as material for floorings are considered under their respective headings in the succeeding chapters.

SOME REPRESENTATIVE BRANDS OF FLOORINGS.

Swedish (Red or Yellow).

Extra Firsts	M ♕ H
	♕ S K B ♕
	♕
	K A B
	S ♕ B
	W ♕ B

Firsts without an "Extra First" above them.	HS ♕ ND MARMA ♕ HTA ♕ SV ♕ VIK W ♕ W E ♕ E N + W JCK S ♕ F S ♕ L O ♕ W KR ♕ FS J ♕ J
Firsts with an "Extra First" above them.	HMH SKB KAB SBS WSW
Seconds without an "Extra First" above them.	HS ✱ ND MB HT ♕ AB SV ✱ VIK WSW EEE N = W C + K

Notes.—The extra firsts, and firsts where no "extra firsts" are shipped, represent a very small percentage of the shippers' out-turn.

Norwegian.
(Red or Yellow).

Christiania.

Firsts	LHP W ♕ E

Fredrikshald and Fredrikstad.

Firsts
- A H K & Co.
- H × B
- J N J
- S E L L E B A K
- S F A
- W D & Co.
- W I E S E & Co.

Laurvig.

Firsts F R I T Z Ø E

Drammen.

Firsts H O L M E N

Important.—The foregoing brands are only a selection from hundreds of first-class shipments. They are merely put forward as typical and representative examples.

CHAPTER IX.

RED or YELLOW DEAL (*continued*).

IMPORTED SIZES.

An acquaintance with the dimensions commonly obtainable in planks, deals, battens, &c., is likely to be useful in obviating the specification of sizes which are not regularly imported, except where such sizes are called for by special circumstances.

The variety of sizes shipped by the Russian and Scandinavian exporters is so large that there is rarely any necessity to call for widths or thicknesses that are not on the market. Any departure from them necessitates sawing down the importing stuff, and as the remaining strip or "off-cut" is of very little value, the actual cost of sawing does not cover the loss, the price of the converted scantling being further increased by the reduced value of the waste. Thus, an imported 4in. by 7in. will be no dearer in the end than a 3½ by 7 sawn from it.

Outsizes.—In some cases an "outsize" in small scantlings is specified with the avowed intention of compelling the builder to cut it from larger and maturer stuff; but even here it is better, where possible, to fix a "half size" which results without waste from cutting a scantling of double width. Further, there are now so many precedents for the use of comparatively small imported scantlings that where such are forbidden it will

help to prevent misunderstandings if a special clause to that effect is inserted in specifications in the first place.

Sizes obtainable.— Except where otherwise stated, the sizes in the following table are obtainable in both Swedish and Russian shipments.

SAWN GOODS.

4 ×12	(mainly Swedish or Finnish. Rarely received from Petersburg or Archangel)
4 ×11	
4 ×10	(not plentiful)
4 × 9	
4 × 8	
4 × 7	
4 × 6	
4 × 5	(not plentiful)
3 ×12	(not plentiful)
3 ×11	
3 ×10	(not plentiful)
3 × 9	
3 × 8	
3 × 7	
3 × 6	
3 × 5½	
3 × 5	
3 × 4½	
3 × 4	
2½ ×11 2½ ×10	(not plentiful)
2½ × 9	
2½ × 8	
2½ × 7	
2½ × 6½	
2½ × 6	

$2\frac{1}{2} \times 5\frac{1}{2}$
$2\frac{1}{2} \times 5$
$2\frac{1}{2} \times 4\frac{1}{2}$
$2\frac{1}{2} \times 4$
} (not plentiful)

2 ×11
2 ×10 (not plentiful)
2 × 9
2 × 8
2 × 7
2 × 6
2 × $5\frac{1}{2}$ (not plentiful)
2 × 5
2 × $4\frac{1}{2}$
2 × 4
2 × $3\frac{1}{2}$
2 × 3

$1\frac{3}{4}$ ×11
$1\frac{3}{4}$ × 9
$1\frac{3}{4}$ × 8
$1\frac{3}{4}$ × 7
} (not plentiful)

$1\frac{1}{2}$ ×11
$1\frac{1}{2}$ ×10 (not plentiful)
$1\frac{1}{2}$ × 9
$1\frac{1}{2}$ × 8
$1\frac{1}{2}$ × 7
$1\frac{1}{2}$ × 6
$1\frac{1}{2}$ × 5
$1\frac{1}{2}$ × $4\frac{1}{2}$
$1\frac{1}{2}$ × 4
} (not plentiful)

$1\frac{1}{4}$″, 1″, $\frac{3}{4}$″, and $\frac{5}{8}$″ boards, in same range of widths as $1\frac{1}{2}$″.

$\frac{1}{2}$″ boards, widths from 4 to 7, but not plentiful.

Feather edge or weather boards :—

1 × $\frac{1}{4}$ × 7
1 × $\frac{1}{4}$ × 6
$\frac{3}{4}$ × $\frac{1}{4}$ × 7
$\frac{3}{4}$ × $\frac{1}{4}$ × 6
} For fencing.

$\frac{3}{4}$ × $\frac{1}{2}$ × 4 For tiling.

Palings, Slating, and Tiling Battens:—

$\frac{3}{4} \times 3$
$\frac{3}{4} \times 2\frac{1}{2}$
$\frac{3}{4} \times 2$
$\frac{3}{4} \times 1\frac{1}{2}$
$\frac{3}{4} \times 1$

With a limited quantity of $\frac{5}{8}$in., of same widths as $\frac{3}{4}$in.

The lengths of all these sizes (except slating and tiling battens, which rarely exceed 15ft. or 16ft.) range between 5ft. and 24ft., with a very limited quantity of 25ft. to 28ft. No odd inches are imported.

It will be seen that except in boards of $1\frac{3}{4}$in. and under, no odd quarters of an inch in thickness are imported, and there is no imported thickness between 3in. and 4in.

A few standards of 5in. and 6in. thicknesses, from 9in. to 12in. wide, are seen now and then, but they are very scarce, and it is safe to assume that unless Oregon or British Columbian pine (which is obtainable in imported planks 6in., 7in., and 8in. thick), is substituted, anything over 4in. thick will have to be sawn out of fir or pitchpine logs.

The quantity of red fir logs available is now very small. They are hewn and shipped now and again from Archangel, Sweden, and Dantzic, but only in a desultory way. They are neither so large nor so clean as the fine logs which were once imported from Memel, Dantzic, and Riga, and no object is usually to be gained by specifying them. The stock is neither large nor varied, and their conversion would be very wasteful. Scantlings made from them would be more expensive than pitch-pine, the fir logs being less straight-sided and sharp-

edged than the latter. They would contain a larger proportion of sap and knots, unless the sawmiller were allowed to cut away 100 per cent. of waste, and it is not certain that the wood itself would exhibit that superiority in nature which was perhaps justly claimed for the imports of 30 years ago.

They are smaller than the pitchpine and Oregon or British Columbian pine logs which compete with them, rarely exceeding 16in. in width and 25ft. in length.

PLANED GOODS.

These are shipped almost exclusively from Sweden and Norway, Russia's share in this trade being merely a few floorings from Riga. Sizes:—

$1\frac{1}{2} \times 11$	Planed one side and edges.
$1\frac{1}{4} \times 11$	
1×11	
$\frac{3}{4} \times 11$	
$\frac{1}{2} \times 11$	
$1\frac{1}{2} \times 9$	
$1\frac{1}{4} \times 9$	
1×9	
$\frac{3}{4} \times 9$	
$\frac{1}{2} \times 9$	
$1\frac{1}{2} \times 8$	
$1\frac{1}{4} \times 8$	
1×8	
$\frac{3}{4} \times 8$	
$1\frac{1}{2} \times 7$	Floorings, both plain square edged, and tongued and grooved (with a very few grooved for iron tongues in $1\frac{1}{2}''$ and $1\frac{1}{4}''$ thicknesses.)
$1\frac{1}{4} \times 7$	
1×7	
$\frac{7}{8} \times 7$	
$\frac{3}{4} \times 7$	
$1\frac{1}{2} \times 6$	
$1\frac{1}{4} \times 6$	
1×6	

$\frac{7}{8} \times 6$
$\frac{3}{4} \times 6$
$1\frac{1}{4} \times 5\frac{1}{2}$
$1 \times 5\frac{1}{2}$
$\frac{7}{8} \times 5\frac{1}{2}$
$1\frac{1}{4} \times 5$
1×5
$\frac{7}{8} \times 5$
$1\frac{1}{4} \times 4\frac{1}{2}$
$1 \times 4\frac{1}{2}$
$\frac{7}{8} \times 4\frac{1}{2}$
$1\frac{1}{4} \times 4$
1×4

Floorings, both plain square edged, and tongued and grooved (with a very few grooved for iron tongues in $1\frac{1}{2}''$ and $1\frac{1}{4}''$ thicknesses.)

1×7
$\frac{3}{4} \times 7$
$\frac{5}{8} \times 7$
$\frac{1}{2} \times 7$
1×6
$\frac{3}{4} \times 6$
$\frac{5}{8} \times 6$
$\frac{1}{2} \times 6$
$1 \times 5\frac{1}{2}$
$\frac{3}{4} \times 5\frac{1}{2}$
$\frac{5}{8} \times 5\frac{1}{2}$
$\frac{1}{2} \times 5\frac{1}{2}$
1×5
$\frac{3}{4} \times 5$
$\frac{5}{8} \times 5$
$\frac{1}{2} \times 5$
$1 \times 4\frac{1}{2}$
$\frac{3}{4} \times 4\frac{1}{2}$
$\frac{5}{8} \times 4\frac{1}{2}$
$\frac{5}{8} \times 4$
1×4
$\frac{3}{4} \times 4$
$\frac{5}{8} \times 4$
$\frac{1}{2} \times 4$

Matchings, both tongued grooved and beaded and tongued grooved and V jointed.
A few $1'' \times 6''$ and $7''$ are imported, prepared both sides, with a double bead or a double V joint. Occasionally matching with a bead running down the centre of the board, showing a false joint, is shipped, and is known as "centrebeaded." Very rarely it is made with a rebate instead of a tongue and groove.

FINISHED SIZES.

It should be remembered that the nominal sizes of *sawn* timber represent the actual measurements, and those of *planed* stuff represent the measurements before preparing.

Thus, a 3in. by 11in. sawn plank will be found to measure just the specified sizes, but an imported planed board, described and sold as 1 by 11, will be a bare $\frac{7}{8}$in. thick, and a bare $10\frac{3}{4}$in. wide. In practice it is found that a board planed one side and thicknessed, *i.e.*, just catching the cutter on the underside, loses about $\frac{5}{32}$in. If barely $\frac{3}{16}$ are removed, the finished size is accepted, but any greater reduction is legitimate cause for complaint.

Sometimes an architect will specify 1in. or $1\frac{1}{4}$in. "finished" for flooring, but nothing is imported which answers to that description. If therefore the ordinary 1in. nominal is regarded as too thin for any particular purpose, the nominal $1\frac{1}{4}$in., which is the next available size, should be specified. No economy is effected by ordering 1in. finished, as the nominal $1\frac{1}{4}$in. would be supplied, and no object would be served by replaning it to remove the extra eighth. The same applies to matching. Similarly, a so-called 2in. door, being fully planed on both sides, would finish $1\frac{3}{4}$in. full. There was a time when the imported unplaned boards, such as $1\frac{3}{4}$in. by 9in., $1\frac{1}{2}$in. by 9in., &c., were so full in thickness that they stood almost the $1\frac{3}{4}$in. and $1\frac{1}{2}$in. after preparing, enabling the contractor to make finished stiles and rails of those actual dimensions without inconvenience. But they now rarely exceed the nominal thickness.

Nominal dimensions.—As a matter of trade convenience, it is best to adopt the "nominal" dimensions, calculating in advance the loss incurred in preparing, and to make sure that such dimensions are those which are herein tabulated as being permanently on the market. The difference in cost between a planed scantling prepared from, say, 3 by $4\frac{1}{2}$, and one finishing that size is very great, the extra cost of the latter far outweighing any advantage gained by the presence of the extra fraction. These remarks apply equally to soft and hardwoods, but it may be advisable to mention here that in the case of the latter shrinkage in drying has also to be allowed for, as a sawn seasoned 1in. oak or mahogany board would be a fraction under that thickness, even before preparing.

CHAPTER X.

RED or YELLOW DEAL (*continued*).

MARKS OR BRANDS.

It is a matter of common knowledge that most shipments of fir usually carry shipping marks, or brands, and architects and consumers have often lamented the absence of any comprehensive guide or key to their significance. It is the business of this chapter to give all the information possible on the subject, but at the outset it is necessary to warn the reader that the non-existence of any complete and general system of branding makes the determining of qualities and values by marks very difficult indeed. In fact, the really safe and reliable way to judge or check the quality of any particular consignment or parcel is to ignore the brand, and consider the merits or defects of the wood itself; as will be seen from the facts herein set forth.

Dock marks.—Where material is taken direct from the ship to the timber merchant's own yards, the only marks borne are those of the shipper. But where it is stored in the docks, the dock authorities affix marks for identification. Such marks have no reference to quality, and have no ultimate interest for the consumer. But as they are liable to be confused by the examiner with those put on by the shippers, it is necessary to explain their meaning.

They will be found on the ends, usually in white paint, and may refer to any of the following:—

I. Length.

II. Size (only one piece in each pile of uniform size bearing this).

III. Identifying number (usually applied to hardwoods) corresponding to a similar number in the dock company's books, giving dimensions and contents.

IV. Name and rotation number of the ship in which the stuff was brought (only appearing on one piece in each pile of uniform size).

The rotation number needs explanation, as it is a useful guide to the date of import. It consists of a horizontal line, with two or three figures above and below it. The upper figures show the year in which the ship arrived, and the lower indicate its sequence. Thus $\frac{08}{115}$ would imply that the cargo arrived in 1908, and was the 115th received in that year, thereby fixing the date of import as very early in 1908.

Shippers' marks.—The above being disposed of, we are left with the shippers' marks, which may be either letters or numbers, or both, on either the end, the flat, or the edge of each piece. Sometimes they have no significance except to identify the consignment. They may indicate the name of the shipping firm, or the port of origin. They may refer to quality, or they may not. Each particular wood, and each particular firm of shippers, is a law unto itself. It will now be seen how difficult it is to utilise marks as a standard of value or to ensure the maintenance of a desired level of quality by insistence upon the use of certain specified brands.

There are about 500 loading places for red deal in Russia, Scandinavia, and Germany, and the shippers are much more numerous. Some exporters do not sort their output, sending it "as falling," and calling it "unsorted." Others send an "unsorted" which is tacitly understood to represent only their great bulk of ordinary quality, the small proportion of very high grade yielded by their logs being taken out and shipped separately.

Some make five qualities, known respectively as firsts, seconds, thirds, fourths, and fifths. Others make only firsts, seconds, and thirds, their firsts being equal to the firsts and seconds of the former system, and their thirds being equal to a mixture of fourths and fifths.

Then the first of some districts are only equal to the seconds of others. So that when a given mark is identified as a first or second, it does not follow that its exact standing is understood.

Some shippers make a lavish use of "crown" marks on their various qualities, by no means restricting it to their firsts. This disposes of a popular delusion, to the effect that such a mark necessarily implies a high degree of excellence.

Each shipper has his own particular set of brands. So that the timber merchant has to deal with some thousands of sets or series, all differing from one another.

In so far as a shipper's selection of a set of marks is based upon any system at all, it usually consists of a variation of the initials of his firm. In some cases the letters on the different qualities differ slightly, and in others they remain the same, the qualities being indi-

cated by numbers, such as 1, 2, 3, and 4, or stars, crosses, or dashes.

These marks usually appear on the ends, in paint in the case of Swedish, Finnish, Norwegian, and Riga stocks, and hammer-stamps in Archangel and Petersburg shipments. When European deals, &c., are marked by incised letters or figures, without paint, therefore, they may safely be presumed to have a Russian origin. In some cases the shipper makes no alteration in the marks on the ends to correspond with quality, the grade being shown by chalk figures on the flat or edge.

The paint marks on the ends of Scandinavian goods are usually in red. Blue or black paint commonly (but not invariably) indicates that the parcel contains the shipper's discoloured or "blue" goods, *i.e.*, wood of which the sap was not quite bright before shipment.

From a builder's and architect's point of view, the clearest and most convenient system of branding is that adopted by most of the Archangel shippers, who stamp their initials without variation on all qualities, and show the grades by the figures 1, 2, 3, or 4. It is to be regretted that this practice is rarely followed in other districts.

It should be remembered, however, that sometimes it is necessary to stamp a figure on the ends that has nothing to do with quality, for identification only.

Many shippers mark their output of planed goods differently from sawn stuff. A few of the Swedish shippers call their highest grade of planed boards "extra firsts," the next "firsts," and so on.

The foregoing examples show how hopeless it is for the average architect and consumer to expect any help in

forming his judgment upon timber from the marks. The trained timber merchant, of course, after long experience, learns to associate a given brand with an approximate standard of quality. But it varies frequently, within certain limits, from year to year, and will vary yet again according to the weather prevailing on its arrival and the conditions under which it is stored. No one brand ever is so permanently on the market as to be always obtainable in the required sizes at a moment's notice.

Yet it does not follow that marks are to be ignored. The best way to use them is, as before hinted, to note carefully the brand on any delivery which on inspection proves to be well suited for its specific purpose, and to mention that *as a guiding standard* when specifying or purchasing timber for similar work.

That is quite a different thing from insisting on a certain brand and refusing all others. Every shipment has its parallel in other competing stocks, so that when an architect's specification names "Such a brand or equal," the contractor is able to honestly convey to the timber merchant's mind the exact grade required, to obtain it without difficulty, and to honourably fulfil the architect's specific requirements.

CHAPTER XI.

WHITE DEAL (EUROPEAN).

White fir (*Picea excelsa*) is commonly known in the trade as white deal, or simply "white." It is also known as spruce fir, or Norway spruce, but the use of the word spruce is to be deprecated, as tending to create confusion between this wood and the similar growth imported from Canada, which alone is referred to by timber merchants as spruce. It is imported in large quantities from Russia, Sweden, and Norway, and during the last few years an increasing supply has entered the market from Austro-Hungary and the Balkans, viâ Galatz. As its name implies, it is whiter than red or yellow deal, its grain and appearance being otherwise very similar.

Its uses.—The cheaper qualities are largely used for packing-case making, and it is competing extensively with red for building purposes. Practice in England varies considerably with reference to it, the North and Midlands using it for both joinery and carcassing work to a much greater extent than London and the South.

It is not so durable as red in situations where it is exposed to damp, but it possesses qualities which are likely to tell in its favour in the near future, in view of the deterioration noticeable in the shipments of red deal. It is cheap, sound, and tough. Although

it is more liable to warp than red, in properly-seasoned and mature wood this tendency can be overcome. It is less liable to shake in drying, and the pronounced difference in colour between the sap and heartwood which is so marked a feature of red fir is absent from it. The hardness of the knots involves care and extra labour in preparation, but it can be made to exhibit a very fine satiny finish after leaving the plane.

After excluding external work and flooring near the ground, there remains a large variety of purposes for which it can be used with propriety in building, and one of the movements of the near future will be its inclusion in specifications from which it has hitherto been absent. For mouldings, panels of inside doors, cupboards, dressers, matchings, floorings (except on ground floors), joists, and rafters, it will soon be accepted in a class of work above ordinary house-building, in districts where custom has hitherto called for red.

It is imported both sawn and planed. The ports of shipment, methods of sorting, and regular marketable sizes are the same as those of red. A large proportion is shipped "unsorted." It is also exported from Christiania and Petersburg in the form of poles, from 3in. to 6in. diam. at butt, and from 15ft. to 35ft. long, for scaffolding, ladders, &c.

Another kind of white fir (*Picea Pectinata*), sometimes known as Swiss pine, is imported from Central Europe for use as sounding boards in musical instruments. It is otherwise known as bellywood.

CHAPTER XII.

MIXED SHIPMENTS OF RED AND WHITE FIR FOR SPECIAL PURPOSES.

Before leaving the European firs (yellow or red and white deal) it is necessary to consider shortly three other forms in which these woods are imported, viz., pitwood, lathwood, and firewood.

Although only the second of these enters into the architects' calculations, they all bulk so largely in the shipments of to-day that no treatise on timber would be complete without them.

(I.) Pitprops and pitwood.—Pitprops, as the name implies, are imported for use in our mines. They are shipped from Russia, Finland, Sweden, and Norway. With few exceptions, the districts which export fir for building purposes also send pitprops, which are really the tops and other parts of trees which are too small or unsuitable for conversion into sawn stuff.

They contain a mixture of red and white fir, the preponderance of either depending largely upon the district they come from. They are required to be well barked, with the knots adzed down, and the ends cut square. Dry props are naturally preferred, as they are carried by the railway companies at machine weight. They are sold by the top measurements, the sizes running from 2½in. to 8in. diameter, the lengths depending upon the size, thus: 2½in. tops are 2½ft. and up long; 3in. tops are 3ft. and up; and so on.

For convenience they are divided into "short props," 2½ft. to 10ft. long, and "long poles," 10ft. and up, averaging about 15ft. to 16ft. For selling purposes in the home trade prices are fixed at so much per 72 lin. ft.

Though pitprops play by far the more important part in the mining timber trade, large quantities of heavier balk timber are used in the following forms:—

Norway partly-squared timber, roughly hewn on four sides, leaving waney edges, containing redwood and whitewood mixed, sizes running from 6in. to 10in. Sold at per load of 50 cub. ft. calliper measure.

Norway round timber, also containing redwood and whitewood mixed, sizes running from 4in. to 7in. quarter girth. Sold at per load of 50 cub. ft. quarter girth string measure.

Square Swedish timber, well hewn on all four sides, clear of bark, redwood preponderating, and sizes being classified as 4in. to 6in., 6in. to 8in., and 9in. and up. Sold at per load of 50 cub. ft. calliper measure.

These items find their market mainly in Scotland, Wales, and the North and Midlands of England, but the hewn squared timber named above is the same kind of material as is used in longer lengths by builders for hoarding, scaffolding, &c., under the trade name of "balk."

(II.) Lathwood.—Lathwood is the material from which the laths used in plastering are rent or riven. It is imported from Petersburg and Riga, in the form of riven barked segments of those trees whose grain is specially adapted for rending, in lengths of 4ft., 6ft., and 8ft., with a few sevens and nines.

The centres of the trees are not shipped.

The wood is clean and tough, the Petersburg shipments being the more highly esteemed, the Riga wood sometimes containing a percentage of discoloured stuff. The special virtue of lathwood is that when riven into small strips the resultant laths are straight and free from knots. As the knife follows the grain, the lath is stronger and more elastic than a sawn lath of similar dimensions, while the slight irregularity of surface is more securely gripped by the plaster than the smoother face of the sawn article.

Lathwood is sold by measure, at per "cubic fathom" of 6ft. by 6ft. by 6ft. (216 cub. ft. nominal), or "frame" of 8ft. by 6ft. by 6ft. (288 cub. ft. nominal). As the wood is not straight sided the contents are nominal, not actual, the frame, however well packed, containing a considerable proportion of air space. An 8ft. by 6ft. by 6ft. frame of average-sized wood will contain about 220 to 230 pieces, 8ft. long. The larger wood is preferred, as the consequent reduction in the number of pieces to the "frame" implies a smaller loss in wasted air space, and more economical conversion.

The excellence of the home-rent lath, manufactured from imported lathwood, has not prevented the growth of an enormous trade in imported sawn laths, usually $\frac{3}{16}$in. by 1in. and $\frac{1}{4}$in. by 1in., from Sweden, Finland, and Norway. This will be the more readily understood when it is explained that the difference in cost is great, 500ft. of the sawn laths being sold for approximately the same price as 300 of the rent.

Sawn laths are used in 95 per cent. of the villas and cottages built during the last 10 years; and in work of a more ambitious character the great saving in price has admitted them to a very great extent.

One or two of the best Swedish and Finnish shippers manufacture clean, straight-grained elastic sawn laths, the first qualities from Gefle, Bjorneborg, and Rafso being very good indeed. They are imported in bundles containing 500 lin. ft., in lengths ranging from 2ft. to 4½ft.

(III.) Firewood.—The Scandinavian shippers are helped in selling their building dimensions at a reasonable price by the fact that there is a large and regular demand for their waste, under the title of firewood.

This consists of very short ends of redwood and whitewood deals, battens, scantlings, and boards, too small for inclusion in ordinary shipments, ranging from 6in. to about 5ft. in length.

Even in this there are grades, both first and second qualities being exported. Its use is not limited to fuel, as large quantities of it are absorbed in box and packing-case making. Some of the material has nothing against it beyond its small dimensions, so it is not surprising to find that selected sizes are sometimes sold to the small joinery makers who cater for the speculating builder, for sash stiles and rails, &c.

CHAPTER XIII.

LARCH.

(*Larix Europœa.*)

Imported larch.—The larch of commerce is the wood of a North European deciduous conifer, imported from the White Sea district of Russia, and largely grown in the United Kingdom. It enters into the calculations of the builder as a very strong, durable wood, useful for heavy constructional work. It is distinguishable by its bilious tint, being more truly yellow in colour than so-called red or yellow deal. The annual rings are very strongly marked, the spring or summer wood being bright yellow, and the autumn a deep reddish brown. The sapwood is clearly defined, and much paler in colour than the heart, and does not form so large a proportion of the whole as in the case of the firs and pines. It is, therefore, easily obtainable in large scantlings free from sap, and, being tough, lasting, and not unduly knotty, may be freely used for building and engineering work. Seeing that it is obtainable in hewn logs and sawn planks, deals, and boards of the same dimensions as red fir, it might at first sight appear strange that it has not been more extensively used for contract work. But although the first cost of the material is no more than that of fir, the wood is expensive to handle. It is heavy, hard, and not easy to work. It remains sounder in store, but shrinks and warps more. These defects are

serious disadvantages for most joinery and some carcassing work, but where the situation of a scantling does not make such failings prohibitive it may be accepted without hesitation as a good substitute for fir. It is not sorted into qualities, being shipped "as falling," and sold as "unsorted."

The imported logs are hewn, and the consequent waste in conversion is therefore greater than in the case of sawn pitchpine timber. But it is obtainable in square-edged sawn planks, 6 by 12, which cut up more economically. The wood is especially useful for ground and river work, as it offers great resistance to the effects of alternations of wet and dry.

English larch.—The home-grown wood does not attain such large dimensions as the Russian importations, and is therefore not suitable for conversion into square-edged timbering scantlings of any size. But it has the same durability, and is largely used for barn and outhouse work in the country, where it can be used in the round, half-round, or small sawn scantlings. It is very largely used for fencing, &c. Its fairly rapid arrival at maturity, its comparative indifference to vagaries of climate, and its adaptability to a variety of purposes, make it a very valuable tree for home planting, especially in view of its usefulness for telegraph poles.

In the face of unimpeachable testimony to its strength and durability, it is somewhat surprising that the Post-office authorities have not offered more encouragement to its use in competition with imported fir poles. Owing to its density it does not absorb creosote so readily as fir, which evidence of its powers of resistance to external

influences should be in its favour. Unfortunately the official engineers have hitherto exercised a preference for the more spongy and admittedly less durable fir, on the ground that it takes the creosote more easily, which is really making a virtue of a defect. It is to be hoped that while wood remains the staple material for telegraph poles all possible official encouragement will be given to the utilisation of the home-grown product.

There are two varieties of larch grown in Canada and the United States, known to commerce as tamarack. The wood is very similar in character to the European larch, but does not enter into competition with it in the United Kingdom, being mainly consumed in the countries of origin.

CHAPTER XIV.

SPRUCE (Canadian).

This wood, known in the trade as spruce or white spruce, is the product of two North American trees, *Picea alba* and *Picea nigra*. The trees are distinguished by the terms white spruce and black spruce, but though there are differences in their foliage and the colour of their bark, their produce is mixed and exported under the one heading of spruce. Since the development of the aeroplane industry, it has become the fashion to ask for black spruce for making the framework of flying machines, the idea being that this wood yields the best results in the way of toughness, durability, and freedom from knots. But merchants are quite unable to distinguish between the white and the black in converted material.

Spruce resembles European white fir in colour, and is applied to much the same purposes. It is rather wider ringed than white fir or deal, and can usually be distinguished from it on inspecting the ends by the greater size of the annual rings. It therefore wears a slightly more woolly appearance after leaving the saw, but planes up well, giving a nice showy satiny surface. The sapwood is not easily distinguished from the heart. It is very sound, straight-growing, tough, and elastic. The commoner qualities are used for packing-case work, scaffold boards, &c. In the North and Midlands it is

largely used for building. The piano trade also consumes considerable quantities of it.

The better qualities are in demand for internal house fittings. A very small proportion is obtainable almost entirely free from knots. Such parcels are promptly snapped up for making oars and sculls, cupboards and drawers in house and school furniture, &c.

Whence shipped.—It is shipped from Canada (including New Brunswick and Nova Scotia) and Newfoundland, the principal ports of shipment being Quebec, Montreal, St. John's, Halifax, and Miramichi. The best and closest grained wood comes from Quebec and Montreal. It is sometimes unsorted, but usually bracked as firsts, seconds, thirds, and fourths, with a few fifths. The fifths contain only doated or cross-shaken stuff. The fourths are fairly sound, but rough and knotty. The thirds are sound, somewhat coarse, with sound medium-sized knots, and are largely sawn into scaffold boards, and used for packing-case work and carcassing in small buildings. The seconds were once regarded as the lowest quality permissible for use as scaffold boards, but the cheapening tendency of the times has resulted in the general substitution of thirds. This is to be regretted, seeing that life and limb are concerned, but the regular shippers exercise sufficient care in grading the third quality 3 by 9 to permit of its being sawn into $1\frac{1}{2}$ by 9 for scaffold boards with safety, if 10 per cent. or thereabouts of the knottiest and coarsest pieces are eliminated.

The exports from the other districts, viz., St. John's, Halifax, and Miramichi, are usually shipped as unsorted. The wood is a little wider in the rings than the Quebec

and Montreal shipments, but sound and strong, being mainly used for packing cases and common carpentry.

The sizes into which spruce is usually sawn for export to this country are as follows: —

Thickness: 2in., 2½in., and 3in.
Width: 5in., 6in., 7in., 8in., 9in., and 11in.
Length: 6ft. to about 18ft., with a great preponderance of 10ft. to 14ft.

Hardly any boards are sent, and no planed goods. In the Quebec and Montreal shipments the bulk of the cutting takes the form of deals, 3 by 9, 10ft. to 14ft. long.

Marks.—The marks on this wood are very difficult to identify. Quality marks take the form of a figure in chalk on the flat or edge. No quality mark is visible on unsorted goods. Some of the bigger shippers stamp their initials on the ends, but the practice is not by any means universal. The stencilled letters on the ends of sorted spruce deals and battens have no relation to quality, being used solely for the identification of particular parcels or bills-of-lading.

HEMLOCK SPRUCE.
(*Tsuga Canadiensis.*)

Although this tree resembles the spruce of commerce in being a conifer and growing in the same districts, the wood is totally different, being of a greyish brown tint, and lacking the toughness and durability of white spruce. Its extreme cheapness enables it to find a market where quality is a matter of indifference, but it is coarse and brittle, and is not used for building except by a few speculating builders in the commonest work.

It is used, however, for sheeting boards in connection with ferro-concrete work.

OREGON SPRUCE.
(*Picea Sitchensis.*)

This wood is distinct from the Canadian spruce. It is shipped from the state of Oregon, which gives it its commercial name. It is very clean, straight-grained, and easily worked. The tree which yields it attains great size, enabling shippers to cut lengths up to 45ft. and 50ft., and widths up to 24in.

It is shipped in sawn planks, from 3in. to 6in. thick. Its freedom from knots, combined with its useful dimensions, make it a suitable material for boat building. It has not been largely used in architectural work, but is likely to take a more important place on the market in the near future. It is imported in two qualities, clear and select, the former quite free from defect, and the latter nearly so.

CHAPTER XV.

CANADIAN YELLOW PINE.

(*Pinus Strobus.*)

This wood is sometimes known as Weymouth pine and white pine. It is a totally distinct wood from European red fir, but owing to the fact that red fir is commonly known as "yellow" in the South of England, confusion sometimes exists in the minds of the uninitiated. It must also be distinguished from Canadian red pine, which differs again from both these woods. Canadian yellow pine is the mildest, cleanest, and most expensive of the American pines which find a regular market in this country. It grows in Canada and the Northern United States, and is shipped from Quebec, Montreal, New Brunswick, and Newfoundland. The Quebec and Montreal shipments contain the finest timber.

Qualities.—The wood is soft and easily worked. It lacks the strength and toughness of red fir, red pine, pitchpine, and Oregon pine, but for purposes where those virtues are not required in a high degree it is almost without a rival. It is fine and straight in grain, not unlike some of the best growths of Archangel red fir in appearance when worked up, but distinguishable from it by the little dark hairlike marks which are visible on planed surfaces. It is very sound and freer from knots and sap than its competitors. Its chief recommendation, perhaps, is that it reduces warping and shrinkage in finished work to a minimum.

As it does not resist the weather well, it is hardly adapted for outside joinery, but is second to none for inside work of the best class. It has not the bold handsome figure of pitchpine, but does not worry the contractor after doors are hung, &c., as that and other woods are apt to do.

Uses.—It is the recognised wood for making the wooden patterns from which parts of engines are moulded or cast. It is a favourite with brewers, for signboards, &c., and is in request for blind-laths. Very large quantities are absorbed by the cabinet trade and similar industries where lightness, soundness, and freedom from warping are all-important.

Like almost all soft woods, yellow pine has been somewhat wastefully exploited, and the average quality of shipments arriving to-day is not so good as in the past. In fact, recognising the diminution in the supply of full-sized prime logs, shippers avowedly admit into the various grades wood which once would have been bracked a quality lower. The inherent excellences of the wood itself are still there, but absolute freedom from defect is not to be found in even the highest grades, and users must guard against permitting eulogistic descriptions of the material to create expectations which the supplies of commerce will not satisfy. The demand for yellow pine, coupled with the diminishing area of growth, has had its effect on the price, and the cost of the best quality is now about double that of the best red or yellow deal.

Sizes.—It is shipped in sawn planks, deals, and boards, from 6ft. to 16ft. long, 1in. to 3in. thick, by 5in. to 11in. wide, with a limited proportion of 12in. to

20in. widths, technically known as "broad." It is also imported in logs, known as "wancy pine" (not perfectly square edged) in lengths up to about 25ft. averaging from 18in. to 24in. wide, which contain some very choice timber.

The sawn stuff is usually sorted into qualities, known as firsts, seconds, thirds, and fourths, but one prominent firm of shippers sends a grade known as "C quality," which is something between a second and third.

The qualities are not easily recognisable by the marks, as letters are frequently stencilled on the ends for the purpose of identifying particular portions of a cargo, irrespective of quality. As in the case of red or yellow fir, the multiplicity of shippers and brands renders judgment by label dangerous and often misleading, and the material should be judged on its merits alone.

Some well-known shipments which are regularly on the market, and maintain a deservedly high reputation, however, may be identified by the following marks, indented or hammered:—

J. B. & CO.

M A B

P

$

As in the case of fir, quoted marks are merely given as typical and representative examples. There are numerous other first-class shipments.

CANADIAN RED PINE.
(*Pinus Resinosa.*)

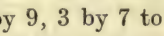
Of all the American and Colonial pines, none bear so close a resemblance to the red fir of commerce (*Pinus sylvestris*) in the character of the wood as red pine. It grows in Canada and the more northerly of the United States, and is shipped from Quebec and Montreal as Canadian red pine.

There is nothing particularly red about the appearance of the wood, the name being derived from the reddish tint of the bark. The knots are rather more conspicuous than in red fir or deal, and there is usually a little greater width in the annual rings. In every other respect it is practically undistinguishable from the European wood, and is used for the same purposes. It probably shakes less in seasoning, and is a favourite with many users on that account. But although some of the older text-books describe the tree as containing very little sapwood, most of the shipments of to-day contain a large proportion of it. No doubt the causes which have lowered the standard of excellence in the Russian and Swedish fir have been at work in the case of this

wood, and the shippers have no longer an unlimited supply of mature and well-grown trees to work upon. Still, the sapwood is usually quite bright, and though noticeable when looking at the end grain, is not easily perceptible when examining the flat or edge of a seasoned deal. The resemblance between the heart and sapwood tends to modify the objection to the latter in joinery work, except for varnished surfaces.

Red pine takes the tool kindly, and yields a nice satiny finish. Altogether its virtues and defects leave it about level with red fir in its suitability for joinery. Its market value is about the same. It makes fair carcassing, being probably neither more nor less durable than red fir of equivalent quality.

Before the advent of sawn planks, deals, and battens from European ports, red pine was largely imported in logs for building, but the bulk and convenience of the red fir supplies have supplanted it to a great extent. Now that Canadian shippers are shipping it in the same form as their Russian and Swedish competitors, however, it has a regular place on the market. It does not give the variety of lengths yielded by the other pines, running mainly from 6ft. to 18ft. It is imported in the following sizes: 4 by 11, 4 by 9, 3 by 7 to 11, 2½in. and 2in. of the same widths, and 1in., 1¼in., and 1½in. boards. It is either sorted into firsts, seconds, and thirds, or sent "as falling" or unsorted. The following marks



appear on three very good representative shipments.

CHAPTER XVI.

PITCHPINE.

(*Pinus Palustris.*)

This wood merits full consideration as one of the most valuable and largely-used softwoods imported into the United Kingdom. It is illustrative of the loose and haphazard way in which timber is named and described that the wood which we receive from North America under the above description is not the kind usually designated pitchpine in the United States. In America the term is more strictly applied to the *Pinus Rigida*, which grows farther north, and is not exported to any great extent at present.

The wood.—Pitchpine, as we know it, is the wood of the *Pinus Palustris* (or *Pinus Australis*), locally known as the long-leaf pine, growing in the Southern and Eastern States, and mainly shipped from Pensacola, Pascagoula, and Mobile. The tree attains much greater dimensions than the European pines, sometimes exceeding 3ft. in diameter and 80ft. in height. In fact, the extent to which it has supplanted Baltic fir is largely due to the readiness with which it yields boards and scantlings of a size unobtainable in the latter wood. The wood of the Cuban pine (*Pinus Cubensis*) and loblolly pine (*Pinus tœda*) is cut and mixed with it indifferently by shippers. The converted material is not easily distinguishable from that of the long-leaf pine,

though the long leaf pine is probably more durable. The Cuban and loblolly pines are not so close in grain, and show a larger proportion of sap.

The joint product of these three pines is imported, under the trade description of pitchpine, in squared logs, planks, deals, and boards, in the following dimensions: —

Logs, 9 to 24 inches square, 16 to 50 feet long.
Planks and Deals 6×12, 4×12, 4×9, 3×11, 3×9, 2×9 } 12 to 32 feet long.
Boards, $1\frac{1}{2}''$, $1\frac{1}{4}''$, and $1''$ thick.
$7''$, $9''$, $11''$, and $12''$ wide, with a few $13''$ to $16''$.
Strips, $2''$, $1\frac{3}{4}''$, $1\frac{1}{2}''$, $1\frac{1}{4}''$, $1''$, and $\frac{3}{4}''$ thick.
$3''$, $3\frac{1}{2}''$, $4''$, and $4\frac{1}{2}''$ wide.

Qualities.—It is not sorted into firsts, seconds, thirds, &c. The logs are not divided into qualities, being shipped under one heading as prime. The inferior logs are not included in contract shipments, being occasionally shipped "on consignment" and auctioned as "pitchpine" without any quality label. The planks, deals, boards, and strips, although obtainable in a bewildering variety of grades under what is known as the "Gulf Coast Classification" in the trade, are commonly imported in two qualities, prime and Rio prime, which may be summarised as joinery and carpenters' stuff respectively. They are not distinguished by quality marks. The prime (or, as some merchants describe it, selected prime) is about equal, in freedom from defect, to the best Russian and Swedish shipments of red or yellow deal. It is very free from knots, practically free

from sap on one face, and suitable for the best joinery and cabinet work. The Rio prime contains centres, with a larger proportion of sap and knots, different parcels varying a great deal in value, but averaging about equally with the third and fourth qualities in deal.

Its cost.—As a guide to architects who may be considering the advisability of specifying pitchpine for joinery, in place of red deal or fir, it may be estimated to cost about 25 per cent. to 30 per cent. more than the latter wood. Only a small proportion of this addition is due to the extra cost of the wood itself, the rest being attributable to the extra labour involved.

As a set-off to the higher cost, it is claimed that the finished work is brighter and more handsome, and clean sap-free surfaces 11in. and 12in. wide are not so difficult to obtain as in the case of deal.

When the class of work demands the absolute exclusion of any particle of even bright sap from visible surfaces, the difficulty of obtaining deal to pass this standard is such that much trouble may be avoided by adopting pitchpine from the first.

There is nothing to be gained by the specification of pitchpine in place of deal for carcassing so far as sizes up to 4 by 12 are concerned. The variety of sizes in imported deals and battens yielded by deal is not obtainable in pitchpine. The scantlings would therefore have to be specially cut from logs or from such deal and plank sizes as are on the market, at a greatly enhanced cost. For large framing scantlings, exceeding 4in. in thickness, there is now only one practicable alternative to pitchpine, viz., Oregon or British Columbian pine. These woods are compared at length in the succeeding chapter,

but it is necessary at this point to consider carefully the respective merits of pitchpine and fir for timbering work.

Obsolete clause.—Unfortunately, many specifications contain a clause which is really a survival from the days, now long past, when red fir logs were very largely imported.

This clause reads as follows: "The timber for carpenters' work shall be cut from Memel, Dantzic, or Riga fir."

The natural inability of architects to keep constantly in touch with the changes which take place in the sources of supply from which building materials are drawn, and the system by which specifications are copied and recopied from older models, have resulted, in this case, in the retention of a formula which is entirely out of date. The supply of Memel, Dantzic, and Riga fir timber, of quality and dimensions suitable for the purpose in view, has dwindled to vanishing point. There is a trifling and desultory supply of small logs, just sufficient to prohibit the assertion that the wood is actually unobtainable, but that is all. Large quantities of square-sawn, sound, straight, and merchantable pitchpine logs are regularly imported, in every way suited to the requirements of contract building work. They have entirely displaced the fir timber, where dimensions over 4in. thick are required, and are almost universally adopted as its natural successors. It is much to be regretted, therefore, that the continued recopying of old specification forms should result in the retention of the clause which demands fir.

In most cases architects accept the substitution of

pitchpine, but here and there disputes arise on the point. Usually it is due to lack of acquaintance with the change that has taken place in the trade, and the natural suspicion which any departure from the written specification arouses. But sometimes it is due to a distinct preference for fir on the part of the architect. Where such preference exists, it is wise to insert in the specification a clause to the effect that no other wood will be passed. Otherwise, contractors are sure to read the clause demanding fir in accordance with prevailing custom, and to regard it as a dead letter. If the large, well-grown logs which were once regularly imported from Memel, Dantzic, and Riga were still obtainable, such a preference might perhaps be justified. But in considering the woods it is only fair to remember that the only comparison possible to-day is between a small and fitful import of moderate-sized fir logs, inferior in most respects to the timber of 30 years ago, and a large supply of sound well-grown pitchpine.

What Laslett says.—In this connection it is interesting to see what was said on the subject by an admitted authority, Thomas Laslett, in his "Timber and Timber Trees," published in 1875, when fir timber was in common use. "Except that pitchpine has a greater specific gravity, there is little to prevent it from being used more extensively than hitherto, in lieu of the Baltic firs. . . . It is employed in wood shipbuilding for beams, shelf, and bottom planking, &c., and also in civil architecture wherever long, straight, and large scantlings are needed. . . . The wood is of a reddish-white colour, clean, hard, rigid, highly resinous, regular and straight in the grain, and, com-

pared with most other pines and firs, is rather more difficult to work; it is durable and good in quality." His experiments in connection with resistance to breaking, bending, and crushing strains result very slightly in favour of Dantzic and Memel fir, pitchpine coming between these two and Riga fir; but the average difference is very small.

In view of the smaller amount of soft summer wood deposited in the annual rings of fir, as compared with pitchpine, there is a probability that the former would exhibit greater durability when exposed for lengthy periods to variations of temperature and humidity. But these comparisons are merely academic, and have little bearing on the commercial problem, which is settled by the absence of the former wood in merchantable quantities and dimensions.

Uses of pitchpine.—Besides carcassing and joinery work, pitchpine is well adapted for flooring. Selected strips, practically free from knots and sap, are imported for preparation into floor boards, usually 1in. to 1¼in. thick by 4in. to 4½in. wide. The tongue and groove are so prepared as to permit of the nails being concealed in the joint, the technical term being, "Prepared for secret nailing." This makes a very handsome and durable floor, and though considerably more expensive than the imported deal flooring, it gives a much more satisfactory result so far as freedom from knots and sap are concerned. To obtain a deal floor of equal freedom from blemish would involve a weeding-out process so severe as to bring the cost up to the level of pitchpine.

Where very heavy wear and tear has to be provided

for, specifications sometimes call for "rift sawn" boards, which are cut in such a manner as to keep the annual rings at right angles to the surface, but this involves a considerable addition to the cost.

The wire mattress industry absorbs large quantities of imported pitchpine strips, from 1½in. to 2in. thick by 3in. to 4in. wide, for making the frames to which the mattresses are attached.

Great care is necessary in using pitchpine for joinery, floorings, matchings, &c., to see that the wood is thoroughly seasoned, as it shrinks considerably in drying.

CHAPTER XVII.

OREGON AND BRITISH COLUMBIAN PINE.

(*Pseudotsuga Douglasii.*)

The tree which yields the Oregon and British Columbian pine of commerce is really a fir, sometimes known as Douglas fir. As the name implies, it is shipped from Oregon, U.S.A., and British Columbia. It is a moot point whether there is any real difference between the produce of the two districts. Some of the Oregon wood is perhaps of a slightly redder tint than the British Columbian, and it has been claimed that the latter is of slower growth and closer texture than the former. But the produce of each State varies considerably in colour and density, and apart from the deeper tint perceptible in some of the Oregon pine it is doubtful whether, in the absence of a label, the place of origin could be declared.

The wood varies in colour from reddish brown to yellow, closely resembling pitchpine in general appearance, is wide ringed, and somewhat coarse in texture, the difference in hardness between the summer and autumn wood being very marked. It is straight grained and sound, and the very great dimensions which the tree attains permit the shippers to export sawn square-edged planks, practically free from sap, in sizes up to 8in. thick and 20in. wide, in lengths

of 12ft. to 40ft., as well as logs up to 30in. square of even greater length.

It is the regular supply of these useful planks which constitutes this wood's chief claim to recognition for building and engineering work. They are piled on land, instead of being floated, so that there are no wet surfaces to be removed, as in the case of pitchpine logs. They can, therefore, be economically converted into large scantlings for roof timbers, &c. The wood does not warp, and contractors have no difficulty in obtaining bright, sound, sap-free surfaces, of straight grain and free from injurious knots.

It is obtaining an increasing vogue among architects of standing, and may be recommended as giving good results at a moderate cost. There are some who have doubts as to its strength and durability. It is admittedly very susceptible to the disintegrating effects of acids when placed in contact with stonework or in the ground. There is a certain proportion of extra wide-ringed timber of a spongy nature, which has a tendency to become tindery when dry. If that is eliminated, however, and the limitations referred to are provided for, there need be no hesitation in using it for the heaviest work.

Uses.—It is largely used in shipbuilding, for masts, deck planking, &c., and forms the staple material for trestle bridges and similar stress-bearing purposes in its place of origin. In common with all woods of its class, it shrinks considerably in drying, but when thoroughly seasoned is useful for joinery, facias, and so forth.

The sawn planks are usually sold as "prime unsorted," but there are two higher grades, known as "select" and

"clear." The "select" is almost free from sap and large knots, and suitable for the best commercial requirements. The "clear" is quite free from defect, and is imported for a few special purposes, such as tent poles for War Office requirements, where absolute freedom from the slightest blemish is demanded.

CHAPTER XVIII.

AMERICAN WHITEWOOD.

(*Liriodendron tulipifera.*)

This wood (sometimes erroneously described as poplar, or basswood) is one of the most valuable of the North American softwoods. It is the product of a large broad-leaved tree, known as the tulip tree, yielding planks and boards up to 30/35in. wide.

It is quite distinct, however, from the tulipwood of commerce, which is a small striped ornamental wood, used for inlaying, &c.

The wood is of close, straight, and even grain, varying from a pale yellow to greenish or greyish white. It is mild, sound, and clean, easily worked, and yields a very fine finish. Its freedom from knots and other defects make it a favourite wood for joinery and cabinet work. The useful widths in which it is obtainable adapt it admirably to panelling, and though in common with all woods it has a tendency to shrink in drying, this fault is not so pronounced as in the firs and pines. Some of the harder and commoner shipments are apt to warp a little, but the use of seasoned stuff of the better grades gets rid of this difficulty.

Unfortunately the trade name of canary whitewood is hardly deserved in the case of most latter-day shipments, the old-fashioned, handsome canary yellow tint being less and less noticeable as time goes on. In fact, shippers seem to be including an increasing proportion

of woods which are not the product of the tulip tree, and which are not so mild or easily worked, though closely resembling it in grain and texture, prominent among them being the wood of the cucumber tree. Some importations show a great deal of sapwood, but the wood is "patchy" in colour, and owing to the varying tints of the heartwood it is not always easy on examining the face to say what is sapwood and what is not. As the wood is never used for constructional or strain-bearing work, sap is admitted to a certain extent in even the highest grades. A large trade is done in boards and strips cut from the outside of the tree, shipped under the name of "saps."

The percentage and width of the heartwood in good shipments is, however, sufficient to enable the contractor to turn out good work without having any difficulty in obtaining the right material from the timber merchant; and it is one of the very few woods in which an architect can reasonably call for practical freedom from defect in the finished article.

Sizes, &c.—The forms of import exhibit a very convenient variety, covering logs, planks, and boards. The lengths run from 10ft. to 20ft. Logs vary from about 18in. to 44in. in diameter, with a preponderance of 24in. to 30in. Planks and boards are mostly from 10ft. to 16ft. long, with a special grade of 18ft. to 20ft., selected for facias; and usually from 6in. to 24in. wide, with a separate and more expensive grade of 24in. to 35in. It is obtainable in 1in., 1¼in., 1½in., 2in., 3in., 4in., 5in., and 6in. thicknesses, unplaned, and is regularly exported by the shippers in planed boards, ⅜in., ½in., ⅝in., ¾in., and ⅞in. thick (finished sizes). These are

planed on both sides, without extra cost to the importer, the saving in freight compensating for the cost of planing.

It is somewhat confusingly graded, there being no universally-recognised system of marking for quality. Some merchants recognise no distinction between the terms "prime" and "first quality." Others sort and sell a "prime" which is superior to their "firsts." There is an ingeniously-named quality known as "selects," which is not quite so good. Then follow "mediums" and "culls." The two latter qualities contain defects which render them the reverse of economical for the builder, however low the price.

It is pre-eminently a wood in purchasing which the consumer will be well advised to ignore brands and grades, preferably giving the merchant a description of the work for which it is wanted, and leaving him to select the required quality. However dangerous this may be in dealing with the unscrupulous trader, it is distinctly the best way to buy any form of timber when the good faith of the merchant can be relied upon. Considering the wood from the architect's point of view, it may be advantageously specified where freedom from knots and smooth, clean finish are desiderata. Its close, fine grain implies absence of figure, so that it does not give the bold effect of, say, Kauri pine. But it takes stain well, and can be made to harmonise with any scheme of colour.

Its cost is approximately the same as that of yellow pine and Kauri pine, and considerably less than that of mahogany, oak, or teak, while the expenditure on labour is very much lower than in the case of the hardwoods.

Although the term "Basswood" is sometimes applied to this material, the Basswood of commerce is a distinct growth, being the product of the American lime or linden tree.

CHAPTER XIX.

TUPELO WHITEWOOD.

(Nyssa uniflora.)

This is a North American wood, the product of a tree quite distinct from that which yields the "American whitewood" or "canary whitewood" of commerce. It is more accurately designated "tupelo" only, the second word in its title being merely a trade term, indicating that it is imported as a competitor of and substitute for genuine canary whitewood. It somewhat resembles the latter in grain, but is rather browner in tint. It is very free from knots, and where used in situations which check its natural tendency to warp may be considered as a legitimate and economical substitute. But it does not work easily, and is not a durable wood, being susceptible to the effects of damp. It is, therefore, of little interest to the architect and builder, being mainly used for cheap work in the cabinet and furniture trades. But it yields excellent results when converted into mouldings. It is a wood that requires careful preparation, but properly handled it will turn out beautifully clean and handsome mouldings at a very low price. It is imported in sawn boards, both planed and unplaned, in much the same dimensions as canary whitewood, with perhaps a somewhat narrower average width. Its current market price is from 40 per cent. to 50 per cent. less than that of prime canary whitewood.

CAROLINA PINE.

(*Pinus echinata.*)

The Carolina pine of British commerce consists mainly of the *Pinus echinata*, a native of the Eastern United States, variously known locally as short-leaf, slash, and yellow pine, but sometimes contains a proportion of loblolly or Oldfield pine (*Pinus tœda*).

It is imported as a competitor with or substitute for pitchpine, which it resembles, but is not adaptable to such a variety of uses as the latter wood. In appearance it suggests a very pale and light pitchpine, and is erroneously supposed by some to actually consist of pitchpine from which the turpentine has been extracted.

It arrives in the form of boards, for manufacture into joinery, &c., very clean and sound, but consisting very largely of sapwood. The marked difference in colour between the light, pale sapwood and the reddish heartwood, and the large proportion of the former in most trees, have made it convenient to ship large quantities of small kiln-dried boards and strips, which show no heartwood, but are practically free from knots, and make bright, clean matching.

It is rarely shipped in larger sizes, and, apart from the small strips referred to, is usually imported in 1in., 1¼in., and 1½in. boards, from 9in. to 12in. wide. It is commonly sorted into extra first, first, and second grades.

COTTONWOOD.

This is another cheap substitute for American whitewood, and is the wood of various North American poplars (*Populus monilifera* and *Populus trichocarpa*), imported in sawn boards. It is white and soft, but not

durable, and though fairly regularly on the market does not find any considerable outlet in the building trade. It holds much the same position in relation to American whitewood as tupelo.

RED CYPRESS.

(*Taxodium distichum.*)

Imported from Louisiana, U.S.A. It is a very useful joinery wood, requiring only to be better known to secure increasing recognition. It is light, strong, and easily worked. Its appearance is something between that of red or yellow deal and pitchpine. It is imported in sound clean boards and planks, practically free from knots, from 10in. to 18in. wide and 10ft. to 16ft. long.

Although a little higher priced than pitchpine, its freedom from defect makes it an economical wood, and architects looking for something not too hackneyed at a moderate cost can safely specify it. It resembles kauri pine in its usefulness for brewers, being unaffected by contact with acids and alkalies. It also resists exposure to damp and soil well.

White cypress is botanically the same wood, but grown on low and swampy ground.

MAPLE.

(*Acer barbatum.*)

A North American wood, known as rock maple and sugar maple.

In colour, a light yellowish to brownish grey. Hard, close and fine in grain. Its commercial uses in this country are mainly limited to two distinct purposes, the figured wood being applied to veneers and the plain to flooring.

It is famous for the variety of its figures, known respectively as "Birds-eye," "Fiddle-back," and "Landscape."

The plain maple flooring, exported from the Eastern United States, has found a permanent market in this country. The compact and even texture of the wood makes it particularly useful for this purpose. It wears well, and the boards are imported ready prepared, tongued, grooved, and holed for secret nailing, well planed, and quite free from knots. It is of course dearer than deal or pitchpine, but considerably cheaper than oak.

The floors of the numerous skating rinks which have recently been established in this country are exclusively made of maple (except where asphalted), laid upon common 1in. tongued and grooved deal flooring. The usual size is 1in. by 2in., 3in., or 4in. (nominal), the narrowest widths of course making the best floor. Considerable allowance has to be made for the great difference between the nominal and actual dimensions of the boards, and loss in tongues. The average length is short, most shipments containing a proportion of 4ft., 3ft., and 2ft. lengths.

Where, as is usual in rinks, the building is hastily constructed, and the joists which support the floor are laid on concrete, the resulting damp is very likely to make the boards swell and rise at the edges. Great care is therefore necessary to secure adequate ventilation.

It is also wise to make the floor an island, separated from its boundary by a gap of about an inch, the division being filled from day to day by one of several strips of slightly varying width. The floor swells or shrinks in accordance with atmospheric conditions to a

surprising extent, so that the strip which suffices at one time is too narrow at another.

There are other American maples, and three distinct varieties growing in England, but their uses are limited to the manufacture of small woodware. One of the native growths (the great maple) is more commonly known as sycamore.

PLANE.

(*Platanus occidentalis.*)

An American tree, the produce of which is variously known in the United States as plane, sycamore, and buttonwood. Not so white as Europeon sycamore, having a reddish-yellow tint, but used for similar purposes.

The European plane (*Platanus orientalis*) is a closely-allied tree, grown rather for ornamental than timbering purposes. The wood resembles beech in appearance.

HICKORY.

(*Carya alba.*)

A tough, hard, light yellowish-brown wood, imported from North America in the form of wheels and other small woodware. Not durable when exposed to the elements, and not used in constructional work.

SEQUOIA.

(*Sequoia sempervirens.*)

This wood is commonly known as Californian redwood. It is reddish-brown, very soft and easily worked, but not strong. It is obtainable in enormous widths, and does not warp when seasoned, but the grain rises, and it is difficult to maintain a permanently smooth surface upon it. It has been used for facias, railway carriage panels, &c., but in spite of its advantages in the way of large dimensions and freedom from knots it does not seem to meet with any great demand in this country.

CHAPTER XX.

OAK.

The oak of commerce is represented by so many species, and is applied to so great a diversity of uses, that there is a danger in works of this kind of being diffuse, and saying so much about it as to confuse the issue in the mind of the student. Before treating the various growths in detail, therefore, it is well to consider the wood as a whole in its relation to the demands of the architect and builder. For architectural work its use may be divided into two headings: first, constructional; and second, ornamental. So far as constructional work is concerned, oak is an over-rated wood. Admitting its excellences in the direction of strength and durability, it is one of the least economical of timbers. Its first cost is high, its waste in conversion is great, and its handling and preparation expensive. This is particularly true of English oak. There are doubtless some kinds of ecclesiastical and other work in which sentiment is everything, and cost is a minor consideration. To such these remarks do not apply, but in all other cases the disadvantages referred to deserve consideration.

It will surprise many to know how closely oak is run by good red fir, pitchpine, and larch in durability, strength, and elasticity. Further, logs, planks, and scantlings that were sound enough when fresh will shake seriously in drying, rendering the use of the wood a very speculative and sometimes vexing business. The

oaks that are most desirable in virtue of their strength and lasting qualities are the worst offenders in this respect; and the one species that is easily and safely workable is the poorest of them all in its essentials. While red fir, larch, pitchpine, and Oregon or British Columbian are procurable in abundance at a moderate cost there is no necessity to specify oak for the framework of any building, unless a client's wish or some other circumstance leaves no alternative.

Where it has to be used the architect will be well advised to impose as little limitation as possible upon the variety or shipment to be used, giving the contractor as much freedom as he can afford.

Good for joinery.—In ornamental work the problem is of an entirely different character, and oak is as much to be commended in this case as it is to be avoided in the other. The reason is that a constant supply of suitable material from both Europe and America is available, in the form of "figured," "quartered," or "wainscot" oak boards and planks, so sawn as to exhibit the fine "flower" or figure (sometimes known as "silver grain") which is the distinctive feature of oak. It happens, too, that the method of sawing which exhibits the figure to the best advantage is the one which most effectually counteracts the tendency to shake in seasoning. So that the wood, besides being ornamental, remains sound, and is as satisfactory to the man who handles it as to the client for whom it is prepared.

As compared with its two largest commercial competitors for good-class joinery—teak and mahogany—its first cost is approximately about the same. Waste in

conversion is perhaps a trifle more, but labour is about the same as on mahogany, and a little less than on teak.

It has the advantage of permitting the architect to carry out a homogeneous scheme of decoration, inasmuch as oak flooring is commercially obtainable to match the doors, panelling, &c., in the same apartment. There is, therefore, nothing to discourage its specification where funds permit. As to the respective merits of the different species, the reader is referred to the detailed consideration which follows, the most important thing to remember being that English is the most expensive and difficult of all.

English oak (*Quercus Robur*).—The English oak of commerce is the product of two species, *pedunculata* and *sessiliflora* (with occasionally a third, *intermedia*), but the merchant makes no distinction between the woods, the differences being those of foliage rather than of quality in the converted material. Its toughness, strength, and durability are unquestioned. But its wastefulness, and the consequent dearness of the finished article, combined with the increased supply of competing woods from other sources, have tended to depose it from its once high estate, so far as architectural purposes are concerned. The wood is firm and tough, varying from greyish white to yellowish brown. It is easily distinguishable by the prominence of the "medullary" or "pith" rays which radiate from the centre of the tree, crossing the annual rings (which are also clearly marked) at right angles. A small percentage of these rays is wider than the others, containing a deposit of light-coloured pith, which when cropping out nearly parallel to the face of the sawn board produces the figure or

silver grain for which oak is prized. It has, however, the serious disadvantage of "shaking" to a large extent in the process of seasoning. So that although the first cost of a parcel of planks put in "stick" to dry may not have been large, the injurious open shakes which develop eventually considerably reduce the final residuum of merchantable wood. If the merchant "quarters" selected logs, this loss is reduced, but then the yield of the tree is less, the width of the quartered planks is comparatively small, and he has to ask a price for the seasoned wood which puts it out of court for any purposes except wainscoting. Then this particular demand is met by the large quantities of Austrian wainscot oak now on the market, which though perhaps less strong and durable is superior in figure to the home-grown timber.

The fine large trees which were once so numerous have been succeeded by a smaller growth, and very large, clean planks are not plentiful. Our landscape is still adorned by many magnificent specimens, but their isolated situation has spoiled them for constructional work, freedom from knots and straightness of grain being excellences which belong rather to forest-grown trees. The result has been that English oak, though in demand for purposes where great lengths and widths are not required, has ceased to find a market in the building trade. The farmer, the manufacturer, and the engineer still find it one of the most valuable of woods; and the timber merchant converts his trees with an eye to their requirements rather than those of the builder. A certain amount of figured and deeply-coloured wood is used for ornamental work, particularly brown oak, which owes its rich deep colour to the old age or

threatening decay of the tree from which it was cut. Although metal has largely superseded it for shipbuilding, "bends" or crooked growths, when reaching large dimensions, find a ready market for knees in boat building. The bark yields the tannin of commerce.

European oak.—The European oak of to-day, so far as it is represented by shipments to the British market, may be summarised as follows:—

Ordinary Logs and Butts	From Dantzic, Memel, Stettin, Odessa
"Wainscot" logs, planks, and boards.	Austria (Trieste and Fiume), Libau, Riga.

The logs and "butts" (short logs of fairly wide dimensions) which we receive from Dantzic, Memel, Stettin, and Odessa, are botanically of the same class as our English oak. The wood is probably inferior to the native growth in strength and durability, but only slightly so, and may be used without hesitation for any purpose which demands the use of oak, except in the case of figured joinery. It is cheaper than English oak, inasmuch as it is easily obtainable in fairly straight, clean logs, recognisable by their octagonal shape. The wood is very similar in appearance to English, but usually a little darker. It is firm and dense, and behaves better in seasoning than the native wood. It is therefore well adapted for sawing into scantlings, sills, &c., but is not remarkable for figure. The ordinary merchantable dimensions are from 6ft. to 25ft. in length and from 10in. to 24in. in diameter. Its market price

is low, but attention must be called to the prevailing system of measurement. It is sold by calliper measure, but no allowance is made for the wany edges or octagonal shape. The calculation is made as if the logs were square, so that the buyer is really paying for more wood than he receives. This is done quite openly, and without intent to deceive, the calliper measure being adopted for convenience sake, and the loss in measure being really discounted by the current market price per cubic foot.

Sometimes users desire to know whether there is any difference in quality between the four shipments, but no one port can claim any permanent superiority, the forests of origin being much the same, and the degree of excellence fluctuating correspondingly. This wood is also largely imported in the form of staves.

Wainscot oak.—The word wainscot has reference solely to form of manufacture, and can be applied to any oak, whatever its origin, which is cut with a view to exhibiting the figure. The wainscot oak of commerce is mainly imported from Austro-Hungary and Russia, through the ports of Trieste, Fiume, Riga, and Libau. Similarly figured oak is imported from America, and is commonly known as "quartered," in accordance with the method of sawing. The European wainscot is prepared by removing a plank from the centre of the log, and sawing the two remaining billets at right angles to the line of the original cut into boards or planks, as may be required. With the exception of a narrow strip at the two narrow edges of the billet, and one or two wide boards at the centre, the boards or planks will show the annual rings and medul-

lary rays running obliquely to the surface, the varying patches of light pith appearing where the rays emerge, and constituting the figure. It is indicative of the changes which have taken place in the timber trade during the last 40 years that Laslett, in his treatise of 1875, revised in 1893, speaks of Riga as the chief source of wainscot oak, referring only to Austro-Hungary as a likely source of future supply. The great bulk of this wood as used to-day is from the latter country, and the Austro-Hungarian shipments are undoubtedly the best. Whether shipped from the Adriatic or the Baltic, the wood is the product of *Quercus sessiliflora* (as in England), or *Quercus cerrio.*

The stamina of the timber is probably inferior to that of the English wood, but as it is exclusively used for decorative purposes that consideration is unimportant. The sawn boards and planks are very sound, clean, and showy. The figure is bold and handsome, and represents the high-water mark of artistic decorative effect. Some merchants import logs or billets and cut and season them here, but a large business is done in boards and planks imported ready sawn. The normal range of dimensions is from 10ft. to 18ft. in length, and 8in. to 16in. in width.

Riga and Libau shipments are not usually so good as Austro-Hungarian. But a percentage of the best shipments from the former places will reach the level of the Adriatic shipments. So that while ordinary Riga and Libau wood, taken as it rises, will not reach the standard of Austrian, it is not impossible for the merchant, by a severe selecting process, to obtain a residue of the required standard. While, therefore, the tendering of the Russian wood requires careful inspection of the

material by the architect or builder, it does not necessarily follow that it implies inferiority of quality or figure. The dry, unplaned boards are difficult to judge, but the finished work will of course speak for itself.

American oak.—The imports of American oak are mostly yielded by *Quercus rubra* and *Quercus alba*, known as red and white oak respectively. The red is the commonest in quality of all regularly imported oaks. It is not durable, but works easily. It is of a reddish-pink tint, coarse in grain, with very little figure. It is imported in sawn boards and planks for cheap furniture, &c.

White oak is a superior wood to the red, rather lighter in colour, closer in the grain, with medullary rays more distinct. It is largely imported in the form of planks and boards, either "plain," *i.e.*, sawn without reference to figure, and "figured." As plain oak it is largely used for sills and similar purposes in building, and for wagon building, turning, &c. In the "figured" form it competes with European wainscot. It is clean and sound, but the figure is smaller, and has not the boldness of the Austrian wood. Its colour, also, is of a pinker tint (though not so markedly as in the case of red oak), and lacks the distinct bright greenish yellow of its competitors. It is slightly narrower, too, in its average width. The differences, however, are not in practice quite so striking as might be expected, and some shipments (notably of Indiana oak) are not always to be easily distinguished from the European wood. It deservedly holds a high place in the list of reliable and reasonably economical decorative woods. It is largely imported in ready-prepared tongued and grooved flooring boards,

holed for secret nailing, both plain and figured, and makes a handsome and durable floor at moderate cost. It is imported to a small extent in the form of squared logs, up to 30ft. to 35ft. long, which are useful for conversion into large scantlings. But like all oaks, it is wasteful where used in anything but small dimensions.

Japanese oak (*probably Quercus glauca*).—This oak is comparatively new to the home market, but seems likely to gain a permanent footing. It is hard, dense, and strong, with a greenish tint, differing somewhat in appearance from both European and American oak. It has hitherto been mainly imported in plain sawn planks, but should repay preparation into wainscot. It does not work easily, and hitherto shipments have not shown so bold and choice a figure as Austrian, but in the near future it will no doubt be imported in the "quartered" form, specially cut to show the flower or silver grain.

(*See* also "Silky Oak (Australian)," p. 151.)

CHAPTER XXI.

ALDER.

(*Alnus glutinosa.*)

A native wood, brownish white, soft, light, and easily worked. Apart from its durability when submerged, it has no special recommendation for use in structural work, but its mild nature and low price make it very useful for turning and miscellaneous small woodware.

ASH.

(*European: Fraxinus excelsior.*)
(*American: Fraxinus acuminata.*)

This wood is not usually considered suitable to the builder's requirements, either for joinery or carpentry, but is sufficiently important to demand a brief notice.

It is a widely-distributed tree, varieties growing on every continent. The kinds most used in this country are the home grown, American, and Hungarian.

The characteristic for which it is most prized, viz., its flexibility, unfits it for structural work, but though it bends too readily for carcassing, it might be used more freely than is customary for decorative effects in joinery, in conjunction or contrast with the darker woods. The best growths in both the European and American varieties are durable, clean, and fairly easily worked. The medullary rays being invisible, it shows no "flower," but the annual rings are clearly marked, and its grain is bold. It sometimes exhibits sufficient figure to warrant cutting into veneers.

The lightest coloured wood is the best. It shows a large proportion of sapwood which approximates so nearly to the heartwood in colour and durability that it is not objected to. It is subject to a darkening of the duramen, known as "black heart," which implies lessened strength and durability.

It finds an extensive and varied market among wheelwrights, cabinet-makers, and manufacturers of sporting requisites, gymnastic apparatus, agricultural implements, tools, &c.

The European ash is botanically the same tree as the English. The best material comes from Hungary, and is not easily distinguishable from the home-grown wood.

We receive shipments from Canada and the United States of similar character. It is known in the places of origin as white ash, to distinguish it from a distinct and less valuable growth called black ash, which is not exported to this country in any great quantities.

There are numerous other varieties, of less importance commercially.

BOX.

(*Buxus sempervirens.*)

From South-eastern Europe; also many growths in East and West Indies, Africa, and Australasia. One of the hardest and closest woods. A bright, even yellow. The staple material for wood-engraving. Also used for inlays, mathematical instruments, &c.

BEECH.

(*Fagus sylvatica.*)

Not a builder's wood. Hard, tough, close-grained, and of even texture. Colour, yellowish white, with a

pale reddish tinge; shows medullary rays like oak. Clean, sound, and stands well when seasoned. Mainly used in chair-making. Useful for wrest planks in pianos, turning, tool handles, and similar purposes. The bulk of the wood used is of English origin, but small quantities of the same growth are imported from Europe, and sometimes a similar wood (*Fagus ferrugina*) from America.

(*See* p. 152 for Australian beech.)

BIRCH.

(*Betula alba. Betula lenta.*)

Birch is essentially a furniture wood, of much the same character as beech. Yellowish white in colour, fairly firm, clean, close, and even-grained; durable when kept dry. It works easily, and remains sound after conversion, and is cheap.

Large quantities of logs and sawn planks are imported from Quebec, Halifax, and St. John, mainly for use in chair-making, turnery, and small woodware. Some of it is figury, and converted into veneers.

ELM.

(*Ulmus campestris. Ulmus Montana.*)
(*Ulmus Americana. Ulmus racemosa.*)

Elm is not a joiner's or carpenter's wood, being tough and wild-grained, difficult to work, and liable to warp. It does not resist alternations of wet and dry conditions well, but where entirely submerged, or on the other hand kept permanently dry, it is strong and durable. Within these limitations it finds a wide market for many purposes, none of which however fall within the province of the architect.

The common English elm is a heavy, hard, deep reddish-brown wood, sometimes facetiously referred to

as British mahogany. It is largely used for coffins, and by wheelwrights, turners, chairmakers, boatbuilders, and blockmakers.

Wych elm (otherwise known as wych hazel, white elm, or Scots elm) is a lighter and milder wood.

The Canadian, or rock, and American elms, imported from Canada and the United States, are also mainly used outside the building trade, but there is a shipment of Canadian elm boards and planks, known as Orhamwood, which is largely used for desks and school fittings. It is much paler in colour than English elm, having a suggestion of ash about its appearance. It is not a very distinguished-looking material, but is clean, fairly easy to work, imported in conveniently merchantable form, and cheap.

SYCAMORE.

(*Acer Pseudo-platanus.*)

A very white wood, grown in Europe and the U.K., firm, but not hard, easily worked, showing medullary rays, and sometimes exhibiting a handsome "fiddle-back" figure. Not durable in exposed situations. Used for domestic woodware, musical instruments, &c. Sometimes confused with the wood of the plane tree.

CHAPTER XXII.

WALNUT.

(*Juglans Regia.*)

The English-grown walnut is of the same species as that imported from Italy and France.

The wood is hard, heavy, and close, of variable colour, ranging from pale to a very deep, dark brown. It yields a very handsome finish, and if it were obtainable in anything like the merchantable dimensions of oak, teak, or mahogany would become a formidable competitor with those woods for decorative joinery.

It is handicapped, however, by the small average size of the available heartwood. The logs and planks of commerce carry a large proportion of light greyish sapwood, totally different in appearance from the heartwood.

This plain pale sapwood would be quite out of place in such good-class work as European walnut would be specified for. Its volume and irregularity are such as to leave a disproportionately small remainder of straight-edged heartwood. The eventual cost of the latter is therefore enormous.

Consequently it cannot be recommended for architectural purposes, and it finds its market in the furniture and allied trades.

The beautifully-figured wood seen in pianos, &c., is usually a veneer, the "burrs" or excrescences which yield such gorgeous effects occurring with great frequency in European walnut.

Where it is necessary to specify the wood, it is wise where possible to give the contractor the widest latitude as to source of supply. It is customary to speak of Italian as being the best of the European imports, but it is sometimes practically unobtainable in the necessary widths and lengths, and French, or in a few cases English, is subsituted.

American or black walnut (*Juglans nigra*).—Not quite so handsome a wood as European, but available more regularly in merchantable dimensions, and less handicapped by excess of sap. It is imported in logs, boards, and planks. The two latter, being sawn square-edged (as distinct from the irregular form of the European wood), are much more economical in conversion.

The wood is mainly consumed in the cabinet trades, and in shop-fitting, &c. It is durable and easily worked, and there is nothing against its specification for ordinary joinery where large dimensions are not required.

It is imported in various qualities, known as prime, selects, mediums, and culls. The boards range in thickness from $\frac{3}{8}$in. to $1\frac{1}{2}$in., the widths range from 3in. to 18in., and the lengths from 4ft. to 18ft. There are also a considerable number of planks imported. These range from 2in. to 5in. thick, 3in. to 18in. wide, and in lengths 4ft. to 18ft.

Satin walnut (*Liquidambar styraciflua*).—An American wood, shipped from the Eastern United States, variously known at the places of origin as sweet gum and red gum. It is very inappropriately named, not being a walnut at all.

It is much lighter in colour and softer than walnut.

Its chief virtues are its cheapness, freedom from knots, and the readiness with which it yields a bright, satiny finish. It is imported in sawn boards, and largely used for cheap furniture, but is of little interest to the architects, its tendency to warp and shrink unfitting it for joinery work. It has also been used in some quarters for wood paving, but opinions differ as to its suitability for this purpose.

The "Hazel Pine" of commerce is the sapwood of the same tree.

CHAPTER XXIII.

MAHOGANY.

(*Swietenia Mahogani.*)

The mahogany of commerce may be roughly divided into three divisions—Cuba, Honduras, and African. This is not so much a botanical classification as a convenient system of trade grouping, each division including several woods of similar character from various ports of shipment.

The first class, Cuba, represents the best and most expensive; Honduras is a less choice but very useful wood; and the third, African, is generally cheaper.

Cuba mahogany, as its name implies, is imported from the island of Cuba. This wood and the very similar growth which we receive in limited quantities from St. Domingo may be considered together.

They represent the high-water mark of quality and colour. The wood is very hard, heavy, and close-grained, of a rich, deep, reddish brown. While variations of grain produce handsome "figure" of varying type, known as "roe," "mottle," curl," &c., it does not depend upon these alone for its value, the plainest-grained wood yielding beautiful effects in the direction of lustre and colour. In fact, the great value of the figured wood, when converted into veneers or used in the solid, places it out of court for the architect and builder, except in those very rare cases where cost is a matter of complete indifference.

This is the mahogany which is referred to in the popular term "Spanish," the name implying that it has its origin in places which were once Spanish possessions. Practice varies somewhat, some restricting the title to Cuba and others to St. Domingo; but the word is loosely applied, and if used at all can reasonably be held to cover both woods, in view of their essential similarity. The St. Domingo logs are smaller than those imported from Cuba, and are considered by some to be denser and more deeply coloured; but very few merchants would have the hardihood to dogmatise upon the exact origin of converted stuff from either place.

The wood is the strongest and most durable, as well as the most handsome of mahoganies, but, of course, its cost limits its application to strictly decorative purposes.

It is distinctly the wood to specify where depth of colour and richness of effect are sought; but it is very expensive, greatly exceeding the cost of even good Honduras, and the contractor must not be expected to furnish considerable widths without jointing.

The Cuba and St. Domingo mahogany logs of to-day are mostly of small and medium sizes, ranging chiefly from 10in to 20in. deep at the butt or larger end of the log, and in lengths 10ft. and upwards. The shipments from the various ports vary as regards manufacture. Some consist of well-squared, straight logs, while others are mixed, carrying a large proportion of crooked logs, which make them very wasteful in conversion. Logs 16in. and upwards at the butt end always bring the best prices, of course provided they are straight and sound. The other grades are obtainable at cheaper rates, according to their size and condition.

The scarcity of good-sized logs applies even more to St. Domingo than Cuba, the former being very small.

Architects are sometimes disappointed at the absence from newly-finished work of the opulent depth of tone which characterises the Spanish mahogany seen in old furniture, &c. But it must be remembered that however dry and well seasoned the material may be, each application of the tool reveals a newer and lighter-coloured surface, and freshly-made joinery requires time to darken.

Honduras mahogany differs from Cuba in being less dense and dark. It varies considerably, being sometimes very soft and pale, deepening through a series of gradations to a pronounced red. It is never so close-grained and heavy as Cuba, and rarely attains so deep and rich a colour; but the greater ease with which useful dimensions are obtained, and its lower cost, make it the staple mahogany of commerce.

It is imported in logs from 12ft. to 30ft. long, from 12in. to 30in. square, with a very small proportion slightly exceeding these dimensions in either length or depth.

The logs suffer, though perhaps in a lesser degree than Cuba, from the waste involved by the form of import. They are roughly hewn, following the course of any bend in the growth of the tree, making it sometimes difficult to reproduce anything like the original width in a straight board or panel of any length. Long, straight, well-squared sound logs of good colour are not plentiful.

The cost of finished work is therefore high in proportion to the nominal price of the original log. This waste, however, is approximately parallel with the loss in converting oak; and the reduction in waste on teak effected

by the supply of square-edged planks is discounted by the higher prime cost of that wood.

Honduras mahogany, therefore, is probably in the long run a little less expensive than the other hardwoods as a basis for a scheme of decorative joinery.

The wood from Northern Honduras is usually of superior colour and texture to that from the southern district. Other shipments of what is botanically the same tree are made from Tabasco, Colombia, Panama, and Nicaragua. A certain amount of the wood from these places may be of equal quality and value to Honduras, but a large proportion of it is scarcely so good in texture.

It must be understood, however, that these remarks are merely generalisations, and while the place of origin has an important bearing on the price a merchant pays for his stocks, the range of variation in colour and grain is wide, and good material may exist in shipments from less highly esteemed ports, just as poor stuff may be included in consignments from the favourite districts.

No system of sorting or marking for quality exists, the logs being merely marked with letters and numbers for identification. So that the only safe way of judging joinery work executed in mahogany is to consider the merits and faults of the wood itself. If common Mexican wood is used, it will declare itself in its spongy nature. But if good selected Mexican wood, of firm, close grain and good colour is tendered, it need not necessarily be objected to because it is not possible to certify it as of Honduras origin.

This refers, of course, to the various shipments of the Honduras character; where Cuba or Spanish has been specified no excuse exists for the substitution of anything

else, and if the examiner cannot with certainty identify the wood, he is entitled to an authoritative declaration of origin.

In judging logs, attention should be given to the following points. The centre should be reasonably sound. Very few logs are free from small shakes at the ends, but gaping heart shakes, especially when widest at the centre and narrowing towards the circumference, considerably reduce the value of the log. The centre should be hard and firm. A soft, spongy heart or large decayed knot are serious defects. Small surface shakes showing upon the exterior of the log may not penetrate deeply, and need not excite alarm if the ends appear to indicate that they do not go in far.

The wood should be firm and close-grained, and not too pale. It should not be forgotten though that the redder, better-figured logs are harder to work, and there are some purposes for which very plain, straight-grained light-coloured wood does just as well, besides effecting a saving in labour.

There may be occasions on which figure is looked for. It is not given to everyone to detect the presence of curl, roe, mottle, or feather by an examination of the outside of the log, but a careful use of the gouge here and there should show whether the grain is merely straight and plain or not. Further, if in addition to good figure a log has the virtues of good dimensions, soundness, and straightness, it will probably be earmarked for cabinet work at a price far exceeding the architect's limitations.

In any case it is an advantage that a log should be "well made." This trade term means fairly well squared and not too wasteful in shape. Irregularity of

side, crookedness, and excess of taper imply, of course, considerable loss of wood in conversion.

In inspecting Tabasco and other Mexican logs, it will often be found that they possess a pleasing straightness of side and sharpness of edge as compared with the outlines of Honduras logs. But this is not always an unmixed gain, for the following reason. The Honduras log reproduces the original tree, less certain slabs, and any bend in the outsides will be accompanied by a parallel bend in the course of the centre or heart. The position of the centre being known, it is possible to box or enclose it within a thick "centre plank" when converting, thus confining its tendency to shake to the one piece. But in Tabasco shipments a greater effort is made to render the log as straight as possible. Curving outsides are cut away, leaving a shape with less bend than the original tree. The disadvantage of this is that though the position of the centre is clearly visible at the ends, its course through the roughly-squared scantling is unknown. If the tree had a bend, the heart will make a curve through the log, cropping out into two or more planks when sawn, instead of confining itself to one centre plank.

It will thus be seen that the inspection and valuation of mahogany is a complicated affair. Unsuspected internal defects sometimes manifest themselves when a log is opened; and the most unlikely looking one may yield surprisingly good results. Some are assisted in the task of judging by the sound emitted when the log is struck; but the practice is not of much value to any but the most experienced.

The amateur's mistake as a rule is to be too critical. Armed with a knowledge of the defects to be avoided, he

finds the products of Nature woefully wanting. The appraising of mahogany is largely a speculative estimate of its defects.

The purchase or valuation of boards is more simple. Excellences and defects are more apparent. A better idea of the tone of the finished work can be gathered from the seasoned board than from the fresh log. Soundness, closeness of grain, depth of colour, straightness, and freedom from excessive taper are the points to consider.

Controversy sometimes arises over the system by which mahogany is measured. It is sold to consumers at so much per foot super as 1in., whether in the board, plank, or log, the exact contents being charged. (Boards under 1in. are priced at per superficial foot as they stand.) Merchants buy their logs by "brokers' measure," which deliberately under-estimates the amount of wood in the log to allow for loss through irregular shape and defects; and sometimes users contend that the same over-measure should be conceded to them. Merchants are usually willing to do this when advised before quoting that this method is preferred; but the trade custom being to charge actual measure, they take their over-measure into account before making their price.

Where a contractor has a regular demand for work in mahogany, the great difference in price between seasoned sawn boards and planks on the one hand, and the imported logs on the other, usually warrants his buying logs, having them sawn to various thicknesses, and putting them "in stick" to season.

African (*Khaya senegalensis*).—The trade in African mahogany is a comparatively recent develop-

ment, the wood's permanent representation on the market dating back about a quarter of a century.

It is imported from the West Coast of Africa, the principal sources being Lagos, Benin, Grand Bassam, Axim, Assinie, Grand Lahou, Cape Lopez, Sapeli, and Gaboon.

The wide geographical area covered by its places of origin, with accompanying differences of soil and climate, result in great variations of character in the wood.

The bulk of the wood imported from Lagos, Benin, Grand Bassam, Grand Lahou, Axim, Assinie, and Cape Lopez districts is generally speaking of good quality. Plain and roey logs from these ports always realise good prices according to their merit, whilst the best figured logs, *i.e.*, logs which have roe and mottle combined, sell at very high prices.

It never approaches the hardness and lustre of Cuba wood, but much of it is not unlike Honduras when worked up. It varies in size as much as in quality, sometimes coming to market in logs upwards of 40in. square, but usually ranging from 16in. to 40in. When such logs are sound, of good colour, and close in grain, they are as highly esteemed as any Honduras material.

Where colour varies so much it is difficult to compare it with the West Indian shipments, but while some of it is very light, the bulk is not paler than most of the Honduras wood of to-day. It is looser in grain, and sometimes inclined to be "woolly." It is this fault, and the difficulty in securing a firm, clean-finished surface, which in the main accounts for its cheapness. Workmen complain of the presence of parallel strips of grain from a quarter to half an inch wide, which seem to require planing in opposite directions, the stroke which smooths one roughening the other.

The logs sometimes exhibit diagonal shakes when opened which were not noticeable on the outside. They are probably storm shakes, due to the action of high winds, and covered by later layers or rings of wood, often appearing in otherwise excellent logs.

The possible existence of these two defects makes the purchase of African logs somewhat speculative. But when the grain proves kind, and the log opens sound, any save as compared with the prices of similar-sized Honduras logs is all clear profit.

Bearing these factors in mind, the remarks concerning the selecting and purchase of Honduras logs in the preceding chapter apply equally to African.

There are probably botanical distinctions between some of the shipments, not all of them being the product of *Khaya Senegalensis*; but they are best ignored, the inspector having quite enough to do in taking note of soundness, colour, grain, and shape.

Should the architect ask, "Am I justified in accepting African wood for Honduras?" the reply is in the affirmative, so long as the tone and finish of the completed work are satisfactory. To put it another way, the possible internal shakes and difficult grain are difficulties for the man who converts the log. If he eradicates or overcomes them, and turns out joinery as sound, firm, and well-coloured as that obtainable from Honduras, it smacks of pedantry to be particular about place of origin.

The railway companies are large users of African mahogany, its large dimensions suiting their demand for panels, &c., in carriages.

The wood imported from the Gaboon district hardly justifies the name of mahogany. Most of it is of a very

pale pinky colour, and much is almost white and sometimes of a very woolly nature. Although in isolated cases selected logs have yielded good decorative effects, it does not enter largely into competition with ordinary mahogany for joinery, and is used to a large extent in other industries where cheapness is the main consideration.

(*See* also page 149 for Australian mahogany.)

CHAPTER XXIV

TEAK.

(*Tectona grandis.*)

Teak is the product of a large deciduous East Indian tree, growing in Burmah, Siam, India, and Java.

It is a hard, heavy wood, not remarkable for figure, of varying colour, ranging from brown to yellow; close-grained and not easy to work, but yielding a very handsome finish. It is one of the best and most expensive of joinery woods. Its durability and strength are great, and though impregnated with an essential oil it is fire-resisting in a very high degree. It rarely shakes, shrinks, or warps to any appreciable extent during conversion, and in these respects is a much safer wood for the contractor than most of its competitors.

Its combination of virtues make it a favourite for constructional as well as ornamental work. Railway companies and shipbuilders are large users of it. Its price prohibits its use for the framework of buildings, but it is specified in good-class work for doors, panelling, shop and office fitting, and sometimes flooring; under London County Council regulations it is largely used for staircases.

It is imported in logs and planks, sawn square-edged. The logs are mainly used in those industries which require larger dimensions than the building trade, and the bulk of the manufactured joinery seen by architects is prepared from imported boards, planks, and flitches

The logs contain excellent material, but the difficulty in disposing of the inevitable centre shake makes the use of the imported planks more economical to the joiner. It may be mentioned in passing that the distinguishing marks AA, A, B, and C, used in connection with teak logs, refer not to quality but to size. Logs vary from 10ft. to 30ft. in length and 10in. to 30in. diam., and the limits of lengths and widths of planks are about the same, with a somewhat smaller average.

Of the planks regularly on the market, the great bulk are of Burmese origin, shipped from Rangoon and Moulmein, with occasional consignments from Bangkok in Siam. It is also intermittently exported from Ceylon.

Distinct from these, and appearing in the shape of a somewhat cheaper competitor, is the teak from Java, which requires separate consideration.

Burmese and Siamese teak.—Dealing with the recognised shipments of Burmah and Siam teak, viz., Moulmein, Rangoon, and Bangkok, it may be said that only in the rarest instances is it necessary to make any distinction between the three. They represent exactly the same tree, and in freedom from defect the prime qualities from the three places are on the same plane. Each of these shipments exhibits variations in grain, colour, and weight, and it is doubtful whether the most experienced could safely differentiate between the three when worked up. There is, however, a certain class of very fine material, working more kindly under the tool than the generality of teak, and showing a rich brownish yellow with a greenish tinge, which is recognised as the choicest wood, and this is yielded by Moulmein in a higher degree than Rangoon or Bangkok.

When, therefore, an architect's resources permit him to call for the finest possible results, irrespective of expense, Moulmein is the likeliest wood, but to demand it in any other case is to limit the contractor's sources of supply unnecessarily. Not all the Moulmein wood is of this type, and it would perhaps be unfair to the Rangoon and Bangkok timbers to suggest that such material is never found in them.

All these importations are unfortunately subject to the ravages of a grub, which burrows long channels, sometimes over half an inch in diameter, through the wood. Laslett speaks of it as attacking only diseased or decaying trees, but it is frequently found in what appears to be the finest wood. So widespread are its effects that it is usual to pass within limits small traces of its work upon unimportant and covered surfaces, when judiciously filled with a stopping of teak sawdust and resin.

Java teak is a sort of "poor relation" to that from the mainland, holding much the same position relative to Burmah wood as African mahogany does to Honduras. It is harder, more gritty, and sometimes offers a most obstinate resistance to the tool. It does not usually exhibit quite so rich an effect as the choicest Moulmein, Rangoon, and Bangkok wood, but if average Burmah and Siam teak be compared with the better shipments of Java, the difference is not easily perceptible.

The difference in price between the two is probably due as much to the extra cost of turning the Java wood into joinery as to any intrinsic inferiority. The contractor can buy sawn square-edged Java planks, as sound

as Burmah and Siam planks, and as free from worm-holes, at a somewhat lower price than the latter; but he loses something in labour. It is something of a speculation. The wood may prove as easy to work as its more expensive rivals, or it may not.

Seeing that he can turn out good sound work from the Java importations, the contractor usually considers himself fully entitled to use them, unless wood of Burmese or Siamese origin is insisted on.

Arguing that the saving in cost of material is accompanied by greater expense in preparation, he risks loss in that respect for the sake of the economy effected by his good fortune or good judgment in buying the right Java timber.

The architect's problem is a different one. When the contractor tenders completed work, which is free from defect and indistinguishable from Burmah or Siam teak, the architect is reasonably justified in passing it. But it is only fair to point out that the special attractiveness of the choicest Moulmein wood is rarely, if ever, attained by the other descriptions; and where his specification has clearly emphasized a demand for the highest-class wood, there is no excuse for the substitution of anything else.

Java shipments are of shorter average length than those from the mainland. Besides sawn planks, they include hewn logs and flitches. The latter are very cleverly hewn, being very square, and parallel-sided, the waste in conversion being less than that usually associated with unsawn timber. There is an important distinction between logs and flitches, the latter being free from centres. The logs are of speculative value, in view of the frequent discoveries of internal cavities on conversion. This fault is less likely to occur in the flitches.

In estimating the cost of work executed in teak, allowance should be made for the loss of wood involved by the want of regularity in imported dimensions. A tier of nominally 3in. planks may contain some $2\frac{3}{4}$in., some $3\frac{1}{4}$in., and perhaps $3\frac{1}{2}$in. The widths may vary in the same way, each plank being measured and its exact contents charged.

The average level of quality in the parcels sold as "prime" is very high, the knots and sap which cause so much trouble in many other woods being absent. A small proportion of second quality wood is shipped, but the great bulk of the timber sent to Europe is very good. The inferior stuff is piled separately from the prime, and sold for purposes which demand only very small dimensions, permitting the cutting out of defects.

The shippers' marks are very numerous, and teak is particularly a wood which demands examination on its merits, irrespective of brands. But the following are

Moulmein..... | STEEL |
Rangoon ..... B B T C L
Java ..... J B E M and N I H M

good representative shipments of their respective kinds.

There is a wood on the market known as West Indian Teak, which is probably the product of the Borneo Camphor tree, or Teng Mang. It is offered as a Teak substitute, but is as much like a plain Honduras mahogany as Teak. It does not pretend to possess the distinguished appearance of the Burmese wood, but is easily worked, durable, and economical, being available in sawn planks of useful merchantable dimensions.

Two other woods from Borneo are being shipped as "Number One Teak" and "Number Two Teak." They are both dense, heavy, hard woods, and though having no botanical claim to the title of Teak, are likely to find favour as substitutes. The former is the heavier and darker of the pair, the "Number Two" being of a reddish-yellow tint, and the "Number One" deep reddish-brown. The imported sawn planks are very free from defect.

ENG (or IN).

(*Dipterocarpus tuberculatus.*)

An East Indian wood, exported from Burmah. Hard, heavy, and close grained, of reddish-brown colour. Imported in sawn planks, and offered as a somewhat cheaper substitute for teak. It is obtainable in similar dimensions, of good quality, and very free from defect, but does not convert with the same freedom from warping as teak, and is more apt to shake in seasoning.

The appearance of finished work is not greatly dissimilar to that of teak, but the doubtful behaviour of the timber in course of preparation makes it very speculative. Some joiners like it, and others complain about it. The shipments probably contain the wood of two or even three allied but distinct trees, and the consequent variations of grain and texture are therefore considerable.

YANG.

(*Dipterocarpus, query alatus.*)

A Siamese wood, of the same type as Eng, but not quite so dense and heavy, rather more open in grain, and of a slightly redder tint. It is a very oily wood, and where the oil is present in large measure this factor is a disadvantage, as the process of polishing becomes very difficult. It is rather milder than Eng, and is less liable to warp after conversion.

It is of recent introduction, and the supply is spasmodic. It is imported in sawn planks, very free from defect, up to 7in. and 8in. thick, from 10in. to 34in. wide. It is a little dearer than Eng, and considerably cheaper than Teak.

Whether it finds a permanent place as a Teak substitute will depend upon the readiness with which it parts

with the excess of oil in the process of seasoning. It has not, at the time of writing, been used sufficiently long to settle this point with any certainty.

CHAPTER XXV.

CEDAR, &c.

(*Cedrela odorata.* *Juniperis Virginiana.*)

There are many cedars, covering a wide variety of growths, distributed over Asia, America, and Australia, but in this country the word is commercially used to designate a West Indian wood, imported in hewn logs from Honduras, Cuba, and Mexico.

It is of a reddish-brown colour; clean, light, soft, and easily worked. It is the familiar material of which cigar boxes are made. It is used in cabinet-making, and for much the same purposes as mahogany, but is not hard enough to compete seriously with that wood for joinery work. Its pungent aromatic smell makes it specially useful in cabinets and drawers as a preservative against the attacks of insects.

The red cedar or pencil cedar of the home market is a very similar wood, imported from Florida; but the term pencil cedar is applied in the districts of origin to various growths in Australia, Africa, and Asia.

BORNEO RED CEDAR.

(*Serayah.*)

A mahogany substitute, imported in sawn planks and squares, for conversion into newels, handrails, and balusters. Not so rich in colour as mahogany, and considerably softer. It is well adapted for turning, but does not yield a sufficiently close, hard, polished surface to compete seriously with mahogany for good joinery. Being fairly cheap and economical in conversion, it serves a useful purpose in decent-class speculative house-building.

PADOUK.

(*Pterocarpus indicus.*)

An East Indian hardwood from the Andaman Islands and Burmah. It is hard, heavy, close grained, and of a deep red colour, which fades with exposure. It is very useful when hardness is required, but the small sizes and short lengths in which the wood is imported curtail its uses considerably. It works well, and takes an exceptionally fine polish. It is used for gun carriage building, and is sometimes prepared into newels and balusters.

ROSEWOOD.

(*Dalbergia nigra.*)

There are many woods growing in various parts of Africa, Asia, America, and Australasia owning this name, but the staple rosewoods of British commerce are the Brazilian wood, shipped from Rio de Janeiro and Bahia, and the East Indian. The Brazilian wood is imported in billets, or half logs, without centres, and the East Indian in round logs.

It derives its name from its odour, which is very like

that of the rose. It is one of the handsomest of woods, varying in colour from black, through purple, to reddish-brown, and yielding a fine polish. It is familiar as a furniture and cabinetwood, and might perhaps be utilised to a larger extent than has been usual as a material for decorative joinery where funds permit.

It is expensive, but not so prohibitively dear as some of the veneer woods, as, although the sizes and shape of the imported logs involve serious waste in conversion, it can be used in the solid.

SATINWOOD.

The satinwood of commerce is of two orders, East Indian (*Chloroxylon Swietenia*) and West Indian (*Fagara* (*Zanthoxylum*) *flava*).

The East Indian wood is imported in round logs, the West Indian logs being roughly squared. It is of a handsome light yellow colour, hard, and close grained. Some of the West Indian wood is plain, but where it does show a figure it is very highly esteemed.

Its comparatively small dimensions and very high price limit its use to cabinet work, veneers, inlays, brush backs, &c., but where expense is a matter of indifference it is well worth the consideration of the architect.

It is one of the very few furniture woods which form possible alternatives, in a scheme of decorative joinery, to the orthodox oak, teak, mahogany, &c., its extreme beauty of colour and figure fully justifying its very heavy cost.

Except where veneers are admissible, however, it is only available in comparatively small dimensions. The imported logs are somewhat short and narrow, and wasteful in conversion.

GREENHEART.

(*Nectandra Rodiœi.*)

Imported from Demerara. One of the strongest of woods. Yellowish-green, hard, heavy, and tough. Mainly used in dock work and shipbuilding, being very durable in water. Imported in logs of great length, very straight-grained and free from knots, but too dear and heavy in handling for use in building work.

LIGNUM VITAE.

(*Guaiacum officinale.*)

A West Indian wood. One of the hardest, heaviest, and strongest of woods. Colour, from greenish-black to brown. Uses limited to small woodware, such as sheaves, cogs, &c., where great strength and durability are required.

SABICU.

(*Lysiloma Sabicu.*)

A West Indian wood, hard, heavy, and close-grained. Dark brown, sometimes figured; not unlike mahogany. Very tough and durable. Supply not large.

CHAPTER XXVI.

NEW ZEALAND WOODS.

KAURI PINE.

(*Agathis Australis.*)

Kauri pine is one of the most valuable softwoods known to commerce. It is shipped from the North Island of New Zealand. The regularity of the supply, the convenient form of shipment, and the inherent excellence of the wood combine to place it alongside Canadian yellow pine in the highest grade of joiners' softwoods.

Colour.—The colour varies from yellowish pink to light brown, showing a bolder figure than yellow pine. The tree attains such colossal dimensions (frequently exceeding 10ft. in diameter) that shippers have no difficulty in supplying sound, square-edged sawn planks, without centres and practically free from knots and sap, in widths ranging from 10in. to 36in. It is thus one of the very few woods which permit the contractor to turn out work free from blemish without difficulty in obtaining raw material of the requisite excellence from the timber merchant.

Surface.—It yields a fine satiny surface after planing, and gives the best results in joinery, if care is taken that the wood is thoroughly seasoned. This is an important point, as, though the large planks in which it is imported are very convenient for conversion, their size does not give the wood the same opportunity for drying as smaller dimensions would.

It has the peculiarity of shrinking perceptibly in length, as well as width and thickness—a fact the joiner should take careful note of.

As a carpenter's wood its cost is prohibitive, and it is not certain that it would prove as suitable for carcassing work as red or yellow fir. At any rate, it would be wasteful to use a wood so valuable for ornamental purposes in constructional timbers. Architects are often deterred from specifying it for joinery on account of its high market price, but, though the first cost is heavy, waste is reduced to a minimum, it works up economically so far as labour is concerned, and the result is good value for the extra expenditure. Seeing, also, that shippers are maintaining their high standard in the quality of current shipments, we may expect to see it specified more often in the future where architects are not unduly hampered in the matter of expenditure.

Sizes.—The regular importations of planks usually vary from 3in. to 8in. in thickness, 10in. to 36in. in width, and 10ft. to 28ft. in length, but a proportion of even wider and longer stuff is usually obtainable without much difficulty. Where builders and contractors have reason to anticipate a demand for it, the cutting of such planks into boards and piling in stick to season would probably prove a remunerative investment, in view of the absence from the market of imported boards.

Among the purposes for which Kauri pine is in demand is the making of vessels to contain alcoholic liquors, back and vat makers finding it peculiarly suitable for their requirements. It is not sorted into qualities, shipments to this market containing nothing but first-class material.

NEW ZEALAND WHITE PINE.

(*Podocarpus dacrydioides.*)

Although not yielded by a coniferous tree, this wood is commercially known as a pine, in view of its resemblance in grain and texture, though not in colour, to Canadian yellow pine.

It is whiter than the other pines, light, soft, does not shake in seasoning, and is straight grained and free from knots. These recommendations, combined with a lower cost than that of Kauri pine, have given it a place in the home market for inside fittings, furniture, &c.

It is not a durable wood, however, and does not enter largely into the calculations of the architect and builder.

Its admitted advantages are discounted by its inveterate tendency to warp.

It is imported in boards and planks, from 1in. to 3in. thick, from 10in. to 18in. wide.

RIMU (*Dacrydium cupressinum.*)

Rimu, or New Zealand Red Pine, is one of the most useful and plentiful of the New Zealand softwoods, and is likely to find a permanent place on the British markets.

It is a handsome wood, from light reddish-brown to yellow in colour, firm, durable, and easily worked. The authorities of the New Zealand Lands Department describe it as the most beautifully-figured wood in the Dominion.

It is perhaps unsuitable for use in exposed situations, but makes excellent joinery and cabinet work. Like Kauri pine, it is available in large dimensions practically free from knots and sap. It is used in New Zealand for general building purposes, but will never be cheap enough for carpenters' work in this country.

Architects seeking a new medium for the execution of high-class softwood joinery need not look any farther for material. Used alone, or in conjunction and contrast with Kauri pine, it is described by local experts as yielding a very pleasing effect.

It is imported in clean well-sawn planks and boards. Though the prime cost is not low, the absence of waste in conversion renders it an economical wood.

CHAPTER XXVII.

AUSTRALIAN WOODS.

JARRAH.

(*Eucalyptus Marginata.*)

A hardwood of the Eucalyptus family which abounds in the immense Australian forests.

In appearance somewhat resembling mahogany, especially when fresh cut, but the colour varies from greyish-red to deep chocolate. Weathers somewhat similar in greyness to English oak.

In grain it is fairly straight with inter-woven fibres. This, when taken in conjunction with its hardness and density, renders it a most valuable timber for constructional purposes.

The matured trees attain heights ranging from 90ft. to 120ft. with fine straight stems 3ft. to 5ft. in diameter. For commercial purposes these trees are suitable when of a diameter of not less than 2½ft. Branches are rarely found below 60ft.

It weighs about 70lbs. per cubic foot when fresh cut, which, however, decreases to about 60lbs. when seasoned.

General uses: Excellent for sleepers, paving, pile timbers, wagon building, and fencing. It appears imperishable, and is known to resist the ravages of the white ant.

It is non-inflammable, and for structural purposes is one of the safest timbers that can be employed.

KARRI.

(*Eucalyptus Diversicolor.*)

A hardwood of the Eucalyptus family, and considered to be the finest and most graceful tree of the Australian forest.

The height of the average tree is about 150ft., and diameter averages 6ft. at the base. It starts branching about 80ft. to 90ft. above the ground.

Its dry weight ranges from 55lbs. to 60lbs. per cubic foot.

It is a dense, tough, though elastic wood of a close, straight grain, and is reported as having the greatest breaking strain for this class of timber. Is non-inflammable.

Uses: Excellent for wagon building, telegraph arms, wheelwrighting and colliery work, bridge timbers, and engineering works.

AUSTRALIAN MAHOGANY.

(*Dysoxylum Fraseranum.*)

A reddish wood, resembling cedar as much as mahogany. Not so close or firm as the latter wood, but accepted as an economical substitute. Used for newels, handrails, &c., in medium-class work; also veneers.

Imported in sawn planks, and commonly designated New South Wales mahogany in the English market. Resembles cedar and rosewood in emitting a fragrant smell when freshly cut, and hence confusingly known by those names in the districts of origin.

Not to be confounded with the Australian red mahogany (*Eucalyptus resinifera*), which is a harder and heavier wood, nor the so-called white mahogany (*Eucalyptus acmenoides*).

BLACK BEAN.

(*Castanospermum Australe.*)

From Queensland and New South Wales; known as Moreton Bay chestnut in Australia.

A handsome joinery wood, showing varying tints of brown, suggestive of walnut. Requires care in seasoning and conversion, but yields a showy finish. It has already attracted the attention of architects, and is likely to meet with a growing demand for good-class ornamental work. Some of the principal colonial banks in the City of London have been panelled in this wood with excellent results. Imported in sawn planks.

RED BEAN.

(*Disoxylon Muelleri.*)

An Australian wood of reddish colour, lighter than the Black Bean, and rather harder and coarser in grain and texture.

Imported in sawn planks.

BLACKBUTT.

(*Eucalyptus pilularis.*)

From New South Wales; a heavy, hard, tough, greyish-yellow wood. Mainly used for purposes requiring great strength and durability.

It is difficult to work, but is available in sawn scantlings free from centres, in useful dimensions, and finds an outlet as a substitute for oak in wagon building, &c.

It is used for piling and paving work, but is not likely to interest the builder.

TALLOW WOOD.

(*Eucalyptus microcorys.*)

From New South Wales.

Canary yellow to brown. Heavy, hard, and durable. A very slippery, greasy wood, and therefore useful for dancing floors. Applied to much the same purposes as blackbutt.

SPOTTED GUM.

(*Eucalyptus maculata.*)

From New South Wales. A heavy, strong, tough, durable wood, of yellowish-brown colour.

Useful for heavy strain-bearing constructional work, as a substitute for oak.

TURPENTINE WOOD.

(*Syncarpia Laurifolia.*)

From New South Wales.

A hard, heavy, brownish wood, very resinous, and noted for its resistance to the ravages of the teredo when used for piling, &c., under water.

SILKY OAK.

(*Grevillea robusta.*)

From Queensland. A handsome, light-coloured oak with characteristic figure, the medullary rays being darker than the surrounding tissue, thus reversing the usual order of things.

Takes a fine polish, and makes very showy panelling, bedroom furniture, and veneers.

There are several growths known in various parts of Australia as silky oak. Beefwood and she-oak are terms which also cover a number of varieties, darker and redder than the silky oak.

There is also a white oak exported from Queensland, of similar figure to silky oak, but lighter in weight and "corky" in texture, identified by the presence of gum streaks.

WHITE BEECH.

(*Gmelina Leichhardtii.*)

From New South Wales. A fine specimen of the beech family, whitish, with a tinge of brown. Sometimes shows a neat figure.

Seasons quickly, shrinking very little in the process. Used locally for purposes where a wood rather harder and more durable than pine, and softer than hardwood, is required.

Excellent for carving and general small woodware.

CHAPTER XXVIII.

TASMANIAN WOODS.

BLACKWOOD.

(*Acacia melanoxylon.*)

A handsome joinery and cabinet wood, dark brown in colour, and commonly described as resembling walnut. Largely used for ornamental work in Tasmania, South Australia, and New South Wales, but not likely to find an extensive market in this country, the supply being spasmodic, and the wood requiring very great care in conversion.

BLUE GUM.

(*Eucalyptus globulus.*)

A very strong, durable Tasmanian wood, of yellowish-brown colour, mainly imported for piling, &c., in dock and harbour work.

It is available in logs of great length, very free from knots, but is heavy to handle and liable to shake.

Although excellent in water, the disadvantages referred to prohibit its extensive use in ordinary building work, except where its great length is a consideration.

STRINGY BARK.

(*Eucalyptus obliqua.*)

Of the same family as Tasmanian blue gum.

Applied to much the same purposes, but not so strong or heavy.

Not likely to interest the home building-timber market in this generation.

CHAPTER XXIX.

PHILIPPINE WOODS.

PHILIPPINE CEDAR.

(*Lumbayao.*)

PHILIPPINE MAHOGANY.

(*Red Malacayan.*)

PHILIPPINE TEAK.

(*Yacal.*)

These woods are imported in sawn planks of good quality and merchantable dimensions, from 8ft. to 24ft. long, 1½in. to 8in. thick, and 7in. to 20in. wide.

They have not yet been used sufficiently extensively to permit of reports as to their behaviour during conversion, but they promise to find a growing market for joinery and cabinet work.

The so-called teak, or yacal, is a very handsome wood, of attractive grain, hard, dense, and of lighter colour than Burmese teak.

CHAPTER XXX.

VENEER WOODS.

For several reasons the architect in the past has made little use of veneers in decorative joinery. They are expensive, and in a sense pretentious. The traditions of the profession rightly favour the natural rather than the imitative, and avoid the use of material which pretends to be what it is not. There may conceivably be occasions, however, on which something bizarre is called for by a client who means to have at all costs an original and striking effect. Under those circumstances the orthodox oak, teak, mahogany, and walnut may be thought hackneyed. Then the architect may feel that he is justified in considering veneers.

Veneer cutting has this advantage, that it produces very beautiful surfaces from woods which are so small as to be practically unusable in the solid. Some of the raw material consists of the merest sticks, from 5in. to 6in. diam., only rendered merchantable by the method of rotary cutting. Larger timbers frequently exhibit figure towards the outside of the log only. Veneers are then cut until the plain wood is reached, the latter being used in the solid. In the regular joinery woods, such as mahogany and walnut, the burrs and curls are usually earmarked for veneers, and dry stuff of the finest figure is not easily obtainable in the ordinary thicknesses required for use in the solid.

These considerations are mentioned by-the-way, as sometimes architects who do not realise the extent to which the cabinet trade absorbs figured wood for veneers are surprised at the comparative plainness of the hardwoods tendered for use in joinery.

The following list represents the veneer woods ordinarily obtainable. Timber merchants who specialise in veneers could usually show the enquirer most of them. It is not easy to convey a clear impression of their exact appearance on paper, as two specimens of the same wood may exhibit considerable variations of colour and figure.

Amboyna.—East Indian. Reddish-brown burrs.

Ebony.—East and West Indian and African. Many varieties. Commonly conceived to be black, but not always so, some growths showing considerable variety of colour. The following are obtainable:—

Black ebony.
White ebony.
Green ebony.
Cocus, greenish-purple.
Coromandel, reddish-brown and black. } Classed as
Marblewood, greyish-yellow and black. } Ebony.

Holly.—Home grown. Very white and fine-grained. Also American, of larger growth and more creamy.

Kingwood.—West Indian. Purple, with dark stripes.

Porcupine wood.—East and West Indian. Also known as partridge wood. A palm. Greyish-brown, streaked with numerous dark fibres.

Snakewood.—West Indian. Reddish-brown, with peculiar mottle, suggestive of the markings of a snake.

Tulipwood.—Brazilian. A very beautiful wood, with red stripes, closely resembling the tulip. Not to be confounded with the wood of the tulip tree, which is the canary whitewood of commerce.

Thuya.—North African. A reddish-brown burr, like amboyna.

Zebrawood.—From Guiana. Reddish-brown, striped.

Woods used in the solid, dealt with in other parts of this work, which are also available for veneers:—

CHAPTER XXXI.

LESSER KNOWN COLONIAL WOODS.

Colonial timbers of commercial importance in the districts of origin, not yet regularly imported into the United Kingdom.

AUSTRALIA.

Local Name.	Botanical Name.	Where Grown.
Red Gum	Eucalyptus calophylla.....	Western Australia.
Salmon Gum ..	„ salmonophloia ..	„
York Gum	„ loxophleba	„
Morrell	„ longicarnis	„
Tuart	„ gomphocephala...	„
Wandoo	„ redunca.....	„
Yate	„ cornuta	„
Brush Box ..	Tristania Conferta	New South Wales.
Grey Box	Eucalyptus hemiphloia	„
Blue Gum	„ saligna	„
Grey Gum	„ punctata	„
Ironbark	„ paniculata	„
Red Mahogany or Forest.... Mahogany	„ resinifera	„
White Mahogany	„ acmenoides	„
Forest Oak....	Casuarina torulosa.....	„
Moreton Bay Pine or Colonial Pine.	Araucaria Cunninghamii..	„
White Stringy-bark.	Eucalyptus eugenoides	„
Woollybutt....	„ longifolia	„
Blue Gum	„ globulus	Victoria.
Red Gum	„ rostrata.....	„
Swamp Gum ..	„ regnans	Tasmania.

NEW ZEALAND.

Local Name.	Botanical Name.
Akeake	Olearia avicenniæfolia.
Black birch, or Tawhai.....	Fagus fusca.
Cedar, or Pahautea	Libocedrus Bidwilii.
Hinau	Elœocarpus dentatus.

Local Name.	Botanical Name.
Honeysuckle, or Rewarewa	Knightia excelsa.
Lancewood, or Horoeka	Pseudopanax crassifolium.
Kowhai	Sophora tetraptera.
Maire (black) or olive	Olea Cunningham'i.
Mangeao	Litsea calicaris.
Miro.....	Podocarpus ferruginea.
Black-pine, or Matai	Podocarpus spicata.
Silver-pine	Dacrydium Westlandicum.
Pohutukawa	Metrosideros tomentosa.
Pukatea	Laurelia Novœ Zelandiœ.
Puriri	Vitex littoralis.
Rata	Metrosideros robusta.
Taraire	Beilschmiedia tarairi.
Tea-tree, or Manuka	Leptospermum ericoides.
Titoki	Alectryon excelsum.
Totara	Podocarpus totara.
Towai	Weinmannia racemosa.

CANADA.

Black Ash	Fraxinus sambucifolia.
Green Ash	„ viridis.
Red Ash.....	„ pubescens.
Aspen Poplar	Populus tremuloides.
Balsam Poplar	„ balsamifera.
Beech	Fagus ferruginea.
White or Canoe Birch	Betula papyrifera.
Buttonwood (Sycamore)	Platanus occidentalis.
Red Cedar (Giant Arbor Vitae)	Thuya gigantea.
White Cedar (Arbor Vitae)....	Thuya occidentalis.
Yellow Cedar or Yellow Cypress	Thuya excelsa.
Chestnut	Castanea dentata.
Red Elm, or Slippery Elm	Ulmus fulva.
Western Hemlock.....	Tanga Canadensis.
Ironwood	Ostrya Virginica.
Broadleaved Maple	Acer macrophyllum.
Manitoba Maple	Negunda aceroides.
Silver Maple	Acer dasycarpum.
Soft or Red Maple	Acer rubrum.
Red Oak	Quercus rubra.
Western White Oak	Quercus garryana.
Overcup Oak.....	Quercus macrocarpa.
Pin Oak.....	Quercus palustris.
Western Yellow Pine, or Bull Pine.	Pinus Ponderosa, or Pinus Resinosa.
Western White Pine	Pinus monticola.
Scrub Pine, or Jack Pine	Pinus banksiana.
Engelmann Spruce	Picea Engelmanni.
Tamarack, or Black Larch	Larix Americana.

CHAPTER XXXII.

SPECIFICATIONS.

Suggested formulæ.

The model clauses given in this chapter are intended to assist the architect in defining his requirements, and are drawn up in view of the conditions prevailing in the timber trade to-day.

Red Fir or Deal.

I.—JOINERY.

The wood for joinery to be Baltic or White Sea red or yellow, selected from first or second Swedish, first or second White Sea, or first Petersburg or Finnish.

NOTES.—The synonymous terms "red" or "yellow" would be used in accordance with the practice of the district, red being the common term in the North and Midlands, and yellow in the South.

The word "Swedish" is preferable to naming any one or two of the favourite Swedish shipping ports, such as "Gefle" or "Soderhamn," as many other ports in Sweden now send equally good material.

For the same reason "White Sea" is preferred to "Archangel," as it covers neighbouring ports, such as Onega and others, which also export equally good material.

Specification Variations.

As has been explained, where absolute freedom from blemish is required, red or yellow deal should not be

used. But where that wood is desired, and the nearest possible approach to perfection is demanded, the intention would be best conveyed to the contractor by saying: —

Selected from best quality Swedish or best quality White Sea only. No nominal seconds, nor any selections therefrom, to be used.

This is the severest possible limitation, and can only be called for in the rarest cases. Still, it has the merit of instructing the contractor quite clearly when exceptional excellence is insisted upon.

Where good medium work is wanted, and reasonable economy has to be studied, a client would ensure fair material at a saving by the use of the following: —

The wood for joinery to be Baltic or White Sea red or yellow, selected from second Swedish, second White Sea, or first or second Petersburg or Finnish.

Where economy is all-important, in factory or other cheap work, and surfaces are painted, the words "*Second or third Swedish, second or third White Sea, or second Petersburg or Finnish,*" will convey clearly what is meant. Lest it be supposed that the last formula is too great a concession to cheapness, it should be said that enormous quantities of third quality Swedish and White Sea stuff are regularly made up into joinery. It is only fair to remember, also, that in process of conversion the removal of defect may turn a second or third into the equivalent of a quality higher.

As regards definition of actual quality, apart from origin, the following may serve: —

To be free from injurious open shakes, large loose or dead knots, or more than a small proportion of perfectly

bright sap, and thoroughly seasoned. The admissibility of small shakes, knots, and a modicum of bright sap to be considered in relation to the position of such defects, and their effect upon the visible finished work.

II.—CARPENTERS' WORK SPECIFICATION.

Wood for carcassing or carpentry shall be as follows:—

Sizes 4in. by 12in. and under, sound bright square-edged Baltic or White Sea red or yellow.

Larger sizes to be sawn from prime pitchpine, or Oregon or British Columbian pine or White Sea larch.

Sizes of 2in. to 3in. thick by 4½in. or less in width to be sawn out of larger imported dimensions.

The inclusion of Oregon or British Columbian pine and larch are matters for the Architect's discretion. The important point about the clause is that in naming the woods referred to the practice of to-day is recognised, and the obsolete "Memel, Danzig, or Riga fir" formula is dropped.

Referring to the place of origin of the fir or deal of 4 by 12 and under, there are so many equally desirable shipments from various ports available that limitations are unnecessary. If the words "sound, bright, square-edged" are not regarded as sufficient protection, however, and a standard is required, the words

"Equal to KEMI *brand"*

should meet the case. It should be explained that "KEMI" brand comes from the port of Kemi, in Finland. It is tough, hearty wood, not mild enough for joinery as a rule, but eminently suitable for strain-bearing purposes. After removing the inferior and discoloured material the shippers send the entire output

as "unsorted," but the common practice is to list it in England as "first and second," it being superior in character to most of the nominal Finnish "unsorted." At the same time, it is not suggested that the label "first and second" means the same thing as when applied to material imported for joinery.

III.—FLOORINGS AND MATCHINGS SPECIFICATION.

(1) Referring to the very highest class of work, in which nothing but the best that is imported will do:—

To be extra first or first quality Swedish. Firsts which do not represent the highest grade (i.e., which have an "extra first" shipped above them) will not be accepted.

This is very severe, and usually indicates a case in which some wood other than deal should be used.

(2) Good medium work specification:—

To be first or second quality Swedish, or first Norwegian. Seconds which have two grades (i.e., extra first and first qualities) above them will not be accepted.

Oak.

JOINERY SPECIFICATION.

I.

To be Austrian wainscot; no other will be accepted.

II.

To be Austrian wainscot, or, if from any other place of origin, to be equal thereto in quality and figure.

III.—SLIGHTLY MORE ECONOMICAL FORMULA.

To be American, Libau, or Riga.

NOTES.—A small proportion of the Libau and Riga wood is practically indistinguishable from the Austrian,

the forests of origin being very near to each other. If the merchant can by severe selection produce the requisite quality and figure from the former shipments, the picked material is as good as the Austrian. But the ordinary Libau or Riga is less expensive than the Austrian.

American quartered oak ("quartered" being the equivalent of "wainscot") is slightly cheaper than Austrian. It is a little narrower, and perhaps not so bold and distinguished in figure, but some prefer its rather warmer appearance.

It is more uniformly figured than Austrian, owing to the American shippers' method of quartering, and is free from the proportion of very plain wood present in the Austrian shipments.

SPECIFICATION FOR CONSTRUCTIONAL WORK, OTHER THAN JOINERY.

To be from prime Danzig, Stettin, Memel, or Odessa logs or butts, or prime Canadian logs, or prime American or Japanese planks.

The use of English oak is not commended, on account of its extreme wastefulness.

Mahogany Specification.

I.

To be from selected Cuba and/or St. Domingo wood.

For use when expense is a matter of indifference. Large dimensions not available.

II.

To be from selected Honduras wood, or equal thereto. If African wood is used, only the best growth, equal in colour and texture to Honduras, will be accepted.

Teak Specification.

I.

To be of prime Moulmein wood.

A very severe and exceptional limitation, only suitable for work in which the rarest and highest class material, irrespective of expense, is demanded.

II.

To be of prime Burmah, Siam, or Indian wood.

In this case Burmah covers both Moulmein and Rangoon, the two recognised Burmese ports of shipment.

III.

To be of prime wood, equal to first quality Burmah standard. If Java wood is used, only the best wood, equal in quality and appearance to Burmese, will be accepted.

CHAPTER XXXIII.

TIMBER TRADE TERMS EXPLAINED.

C.I.F. .....Cost (free on board understood), insurance, and freight.

F.O.B. .....Free on board.

F.O.W. .....First open water.

WRACK .....The lowest quality shipped. Sold at buyers' risk. May contain all or any defects.

TORRAK .....Wood sawn from dead trees. Often very free from sap, knots, and shakes. Usually more free from apparent and localised defects than wrack. Sometimes sorted into "superior torrak" and "inferior torrak," the former being deceptively showy.

PLANKS .....In softwoods—sawn sizes over 9in. wide, not less than 2in. thick. In hardwoods—any sizes of 2in. or upwards in thickness, irrespective of width.

DEALS .....Sawn sizes 9in. wide, 2in. or up thick.

BATTENS .....Sawn sizes 6in. to 8in. wide, 2in. or up thick.

BOARDS .....Sawn sizes under 2in. thick.

SCANTLINGS ....Sawn sizes, 2in. and up thick, 3in. to 5in. wide.

PLANCHETTES....Narrow boards.

ENDS .....Short lengths, 8ft. and under in all shipments of softwoods except White Sea Red and White, in which instance 11ft. lengths and under are understood.

BUTTS .....Short logs.

BALK .....Small hewn fir timber, used for scaffolding, &c., usually 4in. to 8in. square.

SIDINGS .....Yellow pine, sawn sizes, 2in. thick.

LUMBER .....An American term, covering all sawn material in boards and planks.

PRIME .....A loosely-applied term of little meaning. Used in America to define a distinct grade of high quality. As used in this country it implies good quality, but by no means freedom from defect. Usually employed in connection with hardwoods.

SELECT .....In American hardwoods, a grade slightly inferior to prime. In Oregon or British Columbian pine, a high-class grade, suitable for good joinery work.

RIO PRIME ....Applied to pitchpine. A grade below prime.

CREOSOTING ....A preserving process consisting of the injection under pressure of creosote oil (distilled coal tar).

BURNETTIZING ..An odourless and uninflammable preserving process. A powerful germicide chemical compound named "Burnettizine Timber Preservative" is injected under pressure, forming an insoluble chemical combination with the albuminous matter in the wood.

KYANISING ....Another preserving process, which consists of steeping the wood in a solution of bichloride of mercury.

POWELLISING....A method of preserving wood by injecting into it a solution of sugar.

RUEPING PROCESS. A variation of the creosote system, in which the wood is subjected to a high air pressure before the creosote is applied.

DESICCATING.....Artificially drying by exposing wood to hot air.

WATER SEASONING. A system of washing out the natural elements contained in the sapwood by immersing logs in running water, the butt ends pointing up stream.

RIFT SAWING....A system of cutting boards, &c., by which the annual rings run at right angles to the surface. The best method of conversion for securing immunity from warping or shaking, but very expensive.

STACK PILES.....Piles in which lengths are mixed.

CABINET PILES ..Piles in which lengths are laid in sequence.

ST. PETERSBURG STANDARD, AND OTHER MEASUREMENTS The latter part of this book contains the major portion of "Haworth's Practical Timber Measurer," and in those pages will be found full particulars and explanations about the St. Petersburg Standard, and, indeed, of most other measurements and systems of buying and selling adopted by the timber and allied trades. A number of useful timber tables are also supplied.

CHAPTER XXXIV

UNITED KINGDOM'S IMPORTS

For the instruction of readers we herewith append the and exported during a single year, the years 1907, 1908, and

		Quantities.		
		Year ended December 31.		
		1907.	1908.	1909.
IMPORTS—HEWN AND SAWN TIMBER.				
Hewn — Fir, Oak, Teak, &c., (other than Pitprops or Pitwood).	From Russia (loads)	349,266	369,535	420,232
	,, Sweden ,,	21,323	24,398	25,617
	,, Norway ,,	48,389	37,054	30,988
	,, Germany ,,	162,433	131,743	94,842
	,, United States of America ,,	181,454	189,800	151,677
	,, British East Indies ,,	33,375	21,851	23,655
	,, Canada ,,	44,667	38,624	34,045
	,, Other Countries ,,	44,105	26,005	20,625
	Total ,,	885,011	839,010	801,681
Hewn: Pitprops or Pitwood ,,		2,627,209	3,041,241	2,626,480
Sawn or Split, Planed or Dressed.	From Russia (loads)	2,251,191	2,304,976	2,612,258
	,, Sweden ,,	1,407,524	1,250,062	1,643,037
	,, Norway ,,	507,569	375,976	397,260
	,, United States of America ,,	548,157	415,151	499,512
	,, Canada ,,	1,124,813	993,920	1,050,106
	,, Other Countries ,,	146,334	148,345	119,908
	Total ,,	5,985,588	5,488,430	5,722,081
Staves of all dimensions (loads)		171,721	147,045	126,339
Mahogany (tons)		104,112	119,481	76,202
Other hardwoods and veneers ,,		199,953	189,672	196,702
EXPORTS—OF IMPORTED TIMBER.				
Hewn Timber (loads)		8,536	13,455	7,576
Sawn or Split, Planed or Dressed ,,		30,180	24,351	22,292
Staves of all dimensions ,,		8,741	7,190	8,566
Furniture Woods, Hardwoods, and Veneers:				
Mahogany (tons)		33,269	22,638	35,018
Other Sorts ,,		10,809	11,538	10,065

AND EXPORTS OF TIMBER.

quantities and values of timber of all descriptions imported 1909 being given for comparison.

		Values.		
		Year ended December 31.		
IMPORTS—HEWN AND SAWN TIMBER.		1907.	1908.	1909.
		£	£	£
Hewn — Fir, Oak, Teak, &c. (other than Pit props or Pitwood.	From Russia	914,117	786,758	758,915
	,, Sweden	41,728	46,875	45,304
	,, Norway	91,678	76,330	65,428
	,, Germany	508,891	406,933	279,725
	,, United States of America	1,007,134	1,066,062	820,421
	,, British East Indies	575,077	379,884	397,932
	,, Canada	350,840	287,347	253,114
	,, Other Countries	450,471	266,951	234,750
	Total	3,939,936	3,299,140	2,855,589
Hewn: Pitprops or Pitwood		3,049,484	3,579,355	2,928,249
Sawn or Split, Planed or Dressed.	From Russia	5,958,447	5,421,264	6,469,858
	,, Sweden	3,610,834	2,980,876	2,533,667
	,, Norway	1,520,832	1,105,966	1,220,688
	,, United States of America	2,266,886	1,671,833	1,832,135
	,, Canada	3,318,822	2,884,622	3,051,227
	,, Other Countries	471,002	456,566	362,280
	Total	17,146,823	14,521,127	15,469,855
Staves of all dimensions		736,422	682,105	546,187
Mahogany		893,288	1,012,949	609,352
Other hardwoods and veneers		1,327,101	1,211,493	1,182,578
EXPORTS—OF IMPORTED TIMBER, &c.				
Hewn Timber		104,473	121,456	92,649
Sawn or Split, Planed or Dressed		188,224	104,235	104,007
Staves of all dimensions		61,944	57,967	66,244
Furniture Woods, Hardwoods, and Veneers:				
Mahogany		316,843	225,206	316,176
Other Sorts		101,995	109,560	112,758
	Total	773,479	618,424	691,834
EXPORTS—OF BRITISH-GROWN WOOD, &c.				
Rough, Hewn, Sawn, or Split Wood and Staves		111,841	98,218	108,395

CHAPTER XXXV.

TIMBER TRADE MEASUREMENTS.

The explanations and tables in the following pages are extracted from the copyright work, "Haworth's Practical Timber Measurer," which may be had separately for 1s. 6d.

The complete edition contains about 40 pages more tables or other information.

The publishers are Alfred Haworth & Co., Ltd., 84, Leadenhall Street, London, E.C., proprietors of the "Master Builder" and the "Timber News."

HOW TO CHECK TIMBER INVOICES.

Explanations of Timber Trade Measurements.

SUPERFICIAL MEASUREMENTS.

Retailers frequently sell Boards, Battens, Deals, and Planks by the *square* or *superficial foot.*

How to get the *Superficial* contents (the number of square feet) of any board or plank.

Always multiply the length in feet by the width in inches and divide the product by 12, taking no notice of the thickness. Thus—

Length.	Width.	Product.		Superficial contents.		
14 ft.	× 9 in.	= 126 in.	÷ 12 =	10 ft.	6 in.	of say ¾ in.
17	× 11	= 187	÷ 12 =	15	7	1½ ,,
19	× 11	= 209	÷ 12 =	17	5	3 ,,
27	× 14	= 378	÷ 12 =	31	6	1 ,,
33	× 17	= 561	÷ 12 =	46	9	1¼ ,,
23	× 19½	= 448	÷ 12 =	37	4	2 ,,

NEW AND QUICK WAY
OF ASCERTAINING SUPERFICIAL MEASUREMENTS.

Divide the number of boards, or the length of the boards, by any number that will best be suitable, and then multiply the width of the boards by the number you divide by.

EXAMPLES SHOWING DIVIDING NUMBER OF BOARDS.

(1.) Take 32 boards, 10 ft. × 7½ in. × 1 in.

Number. Length.

32 ÷ 8 = 4 × 10 = 40 ft.

Width. Number divided by.

7½ in. × 8 = 5 ft.

(In the above we have taken 8 as the number to divide and multiply by.) 200 sup. ft.

(2.) 35 boards, 19 ft. × 6 in. × 1 in.

35 ÷ 7 = 5 × 19 = 95 ft.

6 in. × 7 = 3 ft. 6 in

285

47.6

332.6 sup. ft.

EXAMPLES SHOWING DIVIDING LENGTH OF BOARDS.

(3.) 19 boards, 20 ft. × 9 in. × 1 in.

Length. Number.

20 ÷ 10 = 2 × 19 = 38 ft.

Width. Number divided by.

9 in. × 10 = 7 ft. 6 in.

266

19

285 sup. ft.

(4.) 23 boards, 17 ft. × 5 in. × 1 in.

17 ÷ 17 = 1 × 23 = 23 ft.

5 in. × 17 = 7 ft. 1 in.

161.0

1.11

162.11 sup. ft.

In adopting the above method use a number that will bring the width to even feet if possible (see EX. 1); if not, to bring it to some measurement that is easy to multiply by.

LOG MEASUREMENTS

(SQUARE AND HEWN).

Log Timber is usually sold by the *cubic* foot, or by the load (50 cubic feet). In Scotland Battens, Deals, and Planks are also sold by the *cubic* foot.

How to get the *Cubical* contents (the number of cube feet) of any square or hewn log of any dimensions.

Logs are sold by *string* and *calliper* measure; round timber is sold by string measure, and hewn and square sawn logs are sold by both string and calliper measure. On logs bought by calliper measure no allowance is made for the corners being off, as is always the case with waney and hewn timber, and sometimes even with sawn.

In measuring by the calliper the sides of a log are measured as though it were perfectly square-cornered; by string, the tape or string is passed round the log, its circumference obtained, and this, known as its *girth*, is divided by 4, to get the quarter girth, which is equal to *one* of the sides of a *square log*.

Sometimes the girth is obtained on two or three different places of the log; for particulars see page dealing with Measurement of Round Timber.

When the calliper measure is given, multiply the length in feet by the width in inches of the larger side of the log, next multiply the result—that is, the superficial contents of the larger side, by the width of the smaller side—and divide the total product by 144 or two twelves; the result gives the number of cube feet in the log.

For example, take a log 25 ft. × 15 in. × 13 in. and work as follows, according to above rule:—

25 ft. × 15 in. = 375 in. = sup. conts.
375 in. × 13 in. = 4,875 in.
4,875 in. ÷ 144 = 33 ft. 10 in. cubical contents.

Take another log, 18 ft. × 11 in. × 10 in.:—
18 ft. × 11 in. = 198 in.
198 in. × 10 in. = 1,980 in.
1,980 in. ÷ 144 = 13 ft. 9 in. = cubical contents.

When the string measure is given the length is multiplied by the quarter girth, and the result is multiplied by the same dimension, and this total product is then divided by 144 or two twelves, which gives the cubical contents.

Take a log 28 ft. × 16 in. × 16 in., and work as stated, thus:—

28 ft. × 16 in. = 448 in.

448 in. × 16 in. = 7,168 in.

7,168 in. ÷ 144 = 49 ft. 10 in. = cubical contents.

USEFUL MEASURES.

LINEAL MEASURE.

12 inches	make	1 foot	40 poles	make	1 furlong
3 feet	,,	1 yard	8 furlongs	,,	1 mile
2 yards	,,	1 fathom	3 miles	,,	1 league
5½ yards	,,	1 pole	69 1/10 miles	,,	1 degree
4 poles	,,	1 chain	360 degrees, circumference of the earth		
10 chains	,,	1 furlong			

SQUARE MEASURE.

144 square inches	make	1 square foot
9 square feet	,,	1 square yard
30¼ square yards	,,	1 square pole
40 square poles	,,	1 square rood
4 square roods	,,	1 acre
640 acres	,,	1 square mile

CUBIC MEASURE.

1728 cubic inches	make	1 cubic foot
27 cubic feet	,,	1 cubic yard
108 cubic feet	,,	1 stack of wood
128 cubic feet	,,	1 cord of wood

ROUND TIMBER MEASUREMENTS.

Round timber is sold by the *cubic* foot or the load (50 cubic feet).

HOPPUS' MEASURE.—144 DIVISOR.

To prevent disputes in selling Round Timber, the divisor should be clearly stated on the sale note.

How to get the *Cubical contents* of Round Timber by Hoppus' system.

First obtain the girth (the circumference) of the tree, by means of a tape or string passed round, and divide it by 4, which gives the quarter girth, equal to one of the four equal sides of a square tree or log. Having this, work as before explained to get the Cubical contents.

For instance, suppose a fairly straight tree is 25 ft. long, and at its centre the girth is 52 in. This divided by 4 gives 13 in. The tree would then be reckoned as a log 25 ft. × 13 in. × 13in., and its cube contents obtained accordingly.

If the tree were not very straight, and varied much in size in different parts, it would have to be girthed in three or four places; the girths would then be added together, and the sum divided by the number of measurements taken.

Example.—Suppose this tree 25 ft. long were not straight, and that its girth at the butt were 52 in., at the top 28 in., and at the middle 37 in. These three girths added together make 117 in., and this divided by 3, since the girth was taken in three different places, would give a mean girth of 39 in. Divide this by 4, and you obtain the quarter girth, that is $9\frac{3}{4}$ in. The tree would then be taken as equal to a log 25 ft. × $9\frac{3}{4}$ in. × $9\frac{3}{4}$ in., and its contents obtained in the usual way.

Note also, that in some districts Round Timber is measured *over* the bark, while in others it is measured *under* the bark. That is allowance of from half-inch to inch-and-half is made on the quarter girth of the over-bark measurement.

CUSTOMS' SYSTEM. See next page for ascertaining contents by 113 Divisor.

ROUND TIMBER MEASUREMENTS.

113 DIVISOR (CUSTOMS MEASURE).

To prevent disputes in selling Round Timber, the divisor should be clearly stated on the sale note.

QUARTER GIRTH (STRING) SYSTEM OF MEASURING.—Length to be taken to the half foot, and the quarter girth to the quarter inch. The contents to be computed to the cubic foot, except when the log is 10ft. and under in the length, then the contents are taken to the half cubic foot.

To obtain the contents multiply the quarter girth by itself, then by the length, and divide by, viz: —Customs, 113.
Hoppus, 144.

EXAMPLES.				Examples in working out.
Length.	Quarter Girth.	Customs Contents.	Hoppus Contents.	
ft.	in.	cub. ft.	ft. in. pt.	$10\frac{3}{4}$ $10\frac{3}{4}$ $115\frac{1}{2}$ $16\frac{1}{2}$ Custom
10	12	$12\frac{1}{2}$	10 0 0	113)1905 (16 1808 97
12	$13\frac{1}{4}$	18	14 7 6	
14	14	24	19 0 8	144)1905(13 2 9 1872 12) 33 24 9
16	$12\frac{3}{4}$	23	18 0 9	
$16\frac{1}{2}$	$10\frac{3}{4}$	16	13 2 9	

TIMBER "STANDARDS" EXPLAINED.

THROUGHOUT Great Britain the term "Standard" generally refers to what is known as the "St. Petersburg Standard." The wholesale trade generally sell boards, battens, deals, planks, &c., by the standard. Boards are also sold by the square. The standard (St. Petersburg) deal contains 6ft. of 11in. by 3in., and 120 standard deals make one standard, which is also equal to 165 cub. ft. 2,160ft. of 1in. by 11in. make one standard, as do also 1,980ft. of 1in. by 12in. In the "Practical Timber Measurer" only the St. Petersburg Standard is dealt with.

The Irish or London standard contains 3,240ft. of 1in. by 12in., or 120 deals of 12ft. by 9in. by 3in. Its ratio as compared with the St. Petersburg standard is as 18 to 11.

The Quebec standard contains 100 pieces 12ft. by 2½in. by 11in., or 1,000 lineal feet 3in. by 11in., or 2,750 superficial feet of 1in. boards (229⅛ cub. ft.). Its ratio as compared with the St. Petersburg standard is as 25 to 18.

The Drontheim standard varies for different classes of stuff It contains 198 cub. ft. of sawn deals, &c., 180 cub. ft. of square timber, or 144 cub. ft. of round.

The Wyburg standard contains 180 cub. ft. of sawn deals, &c., 163⅛⅝ cub. ft. of square timber, and 130 cub. ft. of round.

The Christiania standard contains 120 pieces 11ft. by 1¼in. by 9in., or 103⅛ cub. ft. Its ratio to the St. Petersburg standard is as 5 to 8.

The Drammen standard contains 120 pieces 9ft. by 2½in. by 6½in., or 127⅛ cub. ft. Its ratio to the St. Petersburg standard is as 65 to 88.

The Riga "Last" is 80 cub. ft. of sawn deals or square timber.

A load of timber contains 50 cub. ft.

A fathom is 216 cub. ft.

HOW TO OBTAIN "STANDARD" MEASUREMENTS AND PRICES.

The methods of obtaining the exact *St. Petersburg Standard Measurement*, the *Cost* and *Weight* of planks and boards will now be explained.

Suppose specification of planks and boards to be :—

Lot.	Pieces.	Sizes.		
1.	20	16 ft.	× 7 in.	× 3 in.
2.	20	15	× 9	× 3
3.	80	24	× 5½	× ¾
4.	20	18	× 8	× 2½
5.	20	16	× 7	× 2
6.	20	14	× 9	× 1¼

FIRST, HOW TO GET THE "STANDARD MEASUREMENT."

Always reduce each lot as follows, by multiplying the number of pieces and all their dimensions together, thus :—

1st Lot.	3rd Lot.	6th Lot.
20 × 16 × 7 × 3	80 × 24 × 5½ × ¾	20 × 14 × 9 × 1¼
16	24	14
320	1,920	280
7	5½	9
2,240	10,560	2,520
3	¾	1¼
6,720 inches.	7,920 inches.	3,150 inches.

The products thus obtained are then added together, as shown in the sample specification reproduced on next page to get the total number of inches in the parcel, which is, in this case, 37,570.

Pieces.	Sizes.				Inches.
20	16 ft.	× 7 in.	× 3 in.	=	6720
20	15	× 9	× 3	=	8100
80	24	× 5½	× ¾	=	7920
20	18	× 8	× 2½	=	7200
20	16	× 7	× 2	=	4480
20	14	× 9	× 1¼	=	3150
					37,570

Second—Divide the total (in this instance 37,570) by the following *divisors*, thus :—

11) 37570

18) 3415

30) 189 13/18

4) 6·9 13/18

1·2·9 13/18 = Std. 1· qrs. 2· deals. 9 parts. 13/18 Answer = Standard Measurement.

Note.—The contents of any one of the above lots can be obtained just as readily as the total.

For instance, take the second lot and divide the inches, 8,100, as follows :—

11) 8100

18) 736

30) 40 16/18

4) 1·10 16/18 = Std. 0· qrs. 1 deals. 10 parts. 16/18 Answer = Standard Measurement.

ANOTHER METHOD OF GETTING THE STANDARD MEASUREMENT.

This is another way to divide the total, 37,570 inches, given on page 23 :—

3) 37570

6) 12523

11) 2087

120) 189 $\frac{8}{11}$

$1 \cdot 69\frac{8}{11}$ = Std. 1· qrs. 2 deals. 9 parts. $\frac{8}{11}$ = Standard Measurement.

120

Note.—Contents of any of the lots can be obtained by the same *divisors*.

Take the second lot and divide the inches, 8,100, as follows :—

3) 8100

6) 2700

11) 450

$40\frac{10}{11}$ = Std. 0· qrs. 1· deals. 10 parts. $\frac{10}{11}$ = Standard Measurement.

120

SHORT METHODS
OF OBTAINING THE ST. PETERSBURG STANDARD.

See also pages following.

Multiply the number of pieces of any dimension by the lengths, as per examples given here. (These methods will appeal chiefly to the expert.):—

51 Pcs. 10 ft. 4 × 12

10

510
add $\frac{1}{3}$ 170

680
2

11)1360

120)123 $\frac{7}{11}$

Std. 1.0.3 $\frac{7}{11}$

66 Pcs. 10 ft. 3 × 12

10

660
2

11)1320

120)120

Std. 1.0.0

66 Pcs. 12 ft. 2 $\frac{1}{2}$ × 12

12

792
ded. $\frac{1}{11}$ 72

6)720

120)120

Std. 1.0.0

165 Pcs. 12 ft. 1 $\frac{1}{2}$ × 12

12

11)1980

120)180

Std. 1.2.0

330 Pcs. 12 ft. $\frac{3}{4}$ × 12

12

2)3960

11)1980

120)180

Std. 1.2.0

495 Pcs. 12 ft. $\frac{1}{2}$ × 12

12

3)5940

11)1980

120)180

Std. 1.2.0

SHORT METHODS

OF OBTAINING THE ST. PETERSBURG STANDARD MEASUREMENT.

$4 \times 12 + \frac{1}{3} \times 2 \div 11 \div 120$
$11 + \frac{1}{3} \div 6 \div 120$
$10 + \frac{1}{9} \times 2 \div 11 \div 120$
$9 \times 2 \div 11 \div 120$
$8 + \frac{1}{3} + \frac{1}{3} \div 11 \div 120$
$7 + \frac{1}{3} + \frac{1}{6} \div 11 \div 120$
$6 + \frac{1}{3} \div 11 \div 120$
$5 + \frac{1}{9} \div 11 \div 120$
$4 - \frac{1}{9} \div 11 \div 120$
$3 \times 12 \times 2 \div 11 \div 120$
$11 \div 6 \div 120$
$10 - \frac{1}{11} \div 6 \div 120$
$9 + \frac{1}{2} \div 11 \div 120$
$8 + \frac{1}{3} \div 11 \div 120$
$7 + \frac{1}{6} \div 11 \div 120$
$6 \div 11 \div 120$
$5\frac{1}{2} - \frac{1}{12} \div 11 \div 120$
$5 - \frac{1}{6} \div 11 \div 120$
$4\frac{1}{2} - \frac{1}{4} \div 11 \div 120$
$4 - \frac{1}{3} \div 11 \div 120$
$2\frac{1}{2} \times 12 - \frac{1}{11} \div 6 \div 120$
$11 - \frac{1}{6} \div 6 \div 120$
$10 - \frac{1}{6} - \frac{1}{11} \div 6 \div 120$
$9 + \frac{1}{4} \div 11 \div 120$
$8 + \frac{1}{9} \div 11 \div 120$
$7 + \frac{1}{6} - \frac{1}{6} \div 11 \div 120$
$6\frac{1}{2} - \frac{1}{6} + \frac{1}{12} \div 11 \div 120$
$6 - \frac{1}{6} \div 11 \div 120$
$5\frac{1}{2} - \frac{1}{6} - \frac{1}{12} \div 11 \div 120$
$5 - \frac{1}{6} \div 11 \div 120$
$4 - \frac{1}{6} - \frac{1}{3} \div 11 \div 120$
$2 \times 12 + \frac{1}{3} \div 11 \div 120$
$11 - \frac{1}{3} \div 6 \div 120$
$10 + \frac{1}{9} \div 11 \div 120$
$9 \div 11 \div 120$
$8 - \frac{1}{9} \div 11 \div 120$
$7 - \frac{1}{3} + \frac{1}{6} \div 11 \div 120$
$6\frac{1}{2} - \frac{1}{4} + \frac{1}{12} \div 11 \div 120$
$2 \times 6 - \frac{1}{3} \div 11 \div 120$
$5\frac{1}{2} \div 3 \div 6 \div 120$
$5 - \frac{1}{3} - \frac{1}{6} \div 11 \div 120$

$4\frac{1}{2} \div 2 \div 11 \div 120$
$4 - \frac{1}{3} - \frac{1}{3} \div 11 \div 120$
$3 \div 3 \div 11 \div 120$
$2 - \frac{1}{3} \div 3 \div 11 \div 120$
$1\frac{1}{2} \times 13 + \frac{1}{12} \div 11 \div 120$
$12 \div 11 \div 120$
$11 \div 2 \div 6 \div 120$
$10 - \frac{1}{9} \div 11 \div 120$
$9 - \frac{1}{4} \div 11 \div 120$
$8 - \frac{1}{3} \div 11 \div 120$
$7 + \frac{1}{6} \div 2 \div 11 \div 120$
$6\frac{1}{2} + \frac{1}{12} \div 2 \div 11 \div 120$
$6 \div 2 \div 11 \div 120$
$5\frac{1}{2} - \frac{1}{12} \div 2 \div 11 \div 120$
$5 - \frac{1}{6} \div 2 \div 11 \div 120$
$4 \div 3 \div 11 \div 120$
$1\frac{1}{4} \times 12 - \frac{1}{6} \div 11 \div 120$
$11 - \frac{1}{6} \div 2 \div 6 \div 120$
$9 + \frac{1}{4} \div 2 \div 11 \div 120$
$6 + \frac{1}{4} \div 3 \div 11 \div 120$
$1 \times 12 - \frac{1}{3} \div 11 \div 120$
$11 \div 3 \div 6 \div 120$
$10 - \frac{1}{11} \div 3 \div 6 \div 120$
$9 \div 2 \div 11 \div 120$
$8 + \frac{1}{3} \div 3 \div 11 \div 120$
$7 + \frac{1}{6} \div 3 \div 11 \div 120$
$6\frac{1}{2} + \frac{1}{12} \div 3 \div 11 \div 120$
$6 \div 3 \div 11 \div 120$
$5\frac{1}{2} \div 6 \div 6 \div 120$
$5 - \frac{1}{6} \div 3 \div 11 \div 120$
$4\frac{1}{2} \div 4 \div 11 \div 120$
$4 - \frac{1}{3} \div 3 \div 11 \div 120$
$\frac{3}{4} \times 12 \div 2 \div 11 \div 120$
$11 \div 4 \div 6 \div 120$
$10 - \frac{1}{11} \div 4 \div 6 \div 120$
$9 + \frac{1}{3} \div 4 \div 11 \div 120$
$8 \div 3 \div 11 \div 120$
$7 + \frac{1}{6} \div 4 \div 11 \div 120$
$6\frac{1}{2} + \frac{1}{12} \div 4 \div 11 \div 120$
$6 \div 4 \div 11 \div 120$
$5\frac{1}{2} - \frac{1}{12} \div 4 \div 11 \div 120$

SHORT METHODS

OF OBTAINING THE ST. PETERSBURG STANDARD MEASUREMENT.

$\frac{3}{4}\times$ 5 — $\frac{1}{6}\div$ 4 $\div$11 $\div$120
4$\frac{1}{2}$ — $\frac{1}{4}\div$ 4 $\div$11 $\div$120
4 + $\div$ 6 $\div$11 $\div$120
3 $\div$ 8 $\div$11 $\div$120
3$\frac{1}{2}$ — $\frac{1}{8}\div$ 6 $\div$11 $\div$120
2 $\div$12 $\div$11 $\div$120
$\frac{5}{8}\times$12 — $\frac{1}{11}\div$ 4 $\div$ 6 $\div$120
11 — $\frac{1}{6}\div$ 4 $\div$ 6 $\div$120
8 — $\frac{1}{6}\div$ 3 $\div$11 $\div$120
6 + $\frac{1}{4}\div$ 6 $\div$11 $\div$120
4 — $\frac{1}{6}\div$ 6 $\div$11 $\div$120
$\frac{1}{2}\times$12 $\div$ 3 $\div$11 $\div$120
11 $\div$ 6 $\div$ 6 $\div$120

$\frac{1}{2}\times$10 — $\frac{1}{6}\div$ 3 $\div$11 $\div$120
9 $\div$ 4 $\div$11 $\div$120
8 — $\frac{1}{3}\div$ 3 $\div$11 $\div$120
7 + $\frac{1}{6}\div$ 6 $\div$11 $\div$120
6$\frac{1}{2}$+ $\frac{1}{12}\div$ 6 $\div$11 $\div$120
6 $\div$ 6 $\div$11 $\div$120
5$\frac{1}{2}\div$ 6 $\div$12 $\div$120
5 — $\frac{1}{6}\div$ 6 $\div$11 $\div$120
4$\frac{1}{2}\div$ 8 $\div$11 $\div$120
4 $\div$ 9 $\div$11 $\div$120
3 $\div$12 $\div$11 $\div$120
2 $\div$ 3 $\div$ 6 $\div$11 $\div$120

EQUIVALENT OF FEET CUBE IN CUBIC METRES.

Ft. cube.	Cubic metre.	Ft. cube.	Cubic metre
1	·02832	200	5·66306
2	·05663	300	8·49459
3	·08495	400	11·32612
4	·11326	500	14·15765
5	·14158	600	16·98919
6	·16989	700	19·82072
7	·19821	800	22·65225
8	·22652	900	25·48378
9	·25484	1,000	28·31531
10	·28315	2,000	56·63062
20	·56631	3,000	84·94593
30	·84946	4,000	113·26124
40	1·13261	5,000	141·57655
50	1·41577	6,000	169·89186
60	1·69892	7,000	198·20717
70	1·98207	8,000	226·52248
80	2·26522	9,000	254·83779
90	2·54838	10,000	283·15310
100	2·83153		

HOW TO GET COST OF A STANDARD.

How to obtain the *Cost* of say the foregoing 1 std. 2 qrs. 9 deals $\frac{13}{18}$ parts, or any other quantity, at £9. 7s. 6d. per standard, or any other price.

Always work as follows :—

	£	s.	d.
1 std.	9	7	6
2 qrs. ($\frac{1}{2}$ std.)	4	13	9
*9 deals	0	14	$0\frac{3}{4}$
*13 parts of 18 / or 8 ,, 11	0	1	$1\frac{1}{2}$
	£14	16	$5\frac{1}{4}$ cost.

* To get the above 3rd and 4th items, always *double* the price per standard, and call it *pence ;* then multiply the pence by the number of deals and parts, and afterwards divide by pence, and shillings also, if the remainder, after dividing by 12 pence, be over 20.

Example.—In this case the price is £9. 7s. 6d. per standard ; doubled, it gives £18$\frac{3}{4}$, which is called 18$\frac{3}{4}$ pence, thus :—

18$\frac{3}{4}$d. × 9 (deals) = 168$\frac{3}{4}$d. = 14s. $0\frac{3}{4}$d.
18$\frac{3}{4}$d. × $\frac{13}{18}$ (parts) / or 18$\frac{3}{4}$d. × $\frac{8}{11}$ (parts) = 13$\frac{1}{2}$d. = 1s. $1\frac{1}{2}$d. } as above.

HOW TO GET WEIGHT OF A STANDARD.

Boards, battens, deals, planks, &c., are conveyed by rail at computed and not at actual machine weight.

How to calculate the *Weight* of say the foregoing 1 std. 2 qrs. 9 deals $\frac{1}{18}$ parts or $\frac{8}{11}$ parts or any other quantity.

(*Also see Tables elsewhere.*)

OBSERVE.—Rough and unplaned planks, boards, &c. (excepting pitchpine and hardwoods), always are reckoned as weighing as under :—

$2\frac{1}{2}$	tons to one	standard.
$12\frac{1}{2}$	cwt. ,,	quarter.
$1\frac{3}{4}$	qrs. ,,	deal.
$2\frac{1}{2}$	lbs. ,,	part.

Pitchpine deals, &c., under 4-inch, are carried at 3 tons to 1 std.

Planed boards (but not planks), any thickness (except pitchpine and hardwoods), always are reckoned as weighing :

2 tons 2 cwt.	to one	standard.
$10\frac{1}{2}$ cwt.	,,	quarter.
$1\frac{3}{4}$ qrs.	,,	deal.
2 lbs.	,,	part.

The weight of woods can be, therefore, always obtained with multiplying the number of parts by these weights, and then reducing the product to qrs., cwts., and tons.

Example.—Supposing the stuff to be rough boards or planks.

Take the foregoing 1 std. 2 qrs. 9 deals $\frac{1}{18}$ parts or $\frac{8}{11}$ parts.

	T.	C.	Q.	LBS.
1 std. =	2	10	0	0
2 qrs. ($12\frac{1}{2}$ cwt. × 2)	1	5	0	0
9 deals ($1\frac{3}{4}$ qrs. × 9)		3	3	0
$\frac{1}{18}$ parts ($2\frac{1}{2}$ lbs. × 13) or $\frac{8}{11}$ parts (4 lbs. × 8)			1	7
Weight.....	3	19	0	7

Example.—Supposing the foregoing stuff to be planed boards.

	T.	C.	Q.	LBS.
1 std. =	2	2	0	0
2 qrs. (10½ cwt. × 2)	1	1	0	0
9 deals (1⅞ qrs. × 9)		3	0	17
$\frac{13}{112}$ parts (2 lbs. × 13) or $\frac{8}{112}$ parts (3 lbs. × 8)				26
Weight.....	3	6	1	15

From the *Principles* laid down in the several foregoing examples, it will be at once seen that the Standard measurement, and the cost and weight of any sizes of boards, battens, deals, and planks, can be readily and correctly obtained.

TABLES for Calculating Weight of Deals at 2½ Tons to One Standard.

When the St. Petersburg Standard Measurement is given.

Weight of Deals.

Deals	T.	C.	Q.	LBS.
1	...	...	1	19
2	...	...	3	9
3	...	1	1	...
4	...	1	2	19
5	...	2	...	9
6	...	2	2	...
7	...	2	3	19
8	...	3	1	10
9	...	3	3	...
10	...	4	...	19
11	...	4	2	10
12	..	5	...	...
13	...	5	1	19
14	...	5	3	10
15	...	6	1	...
16	...	6	2	9
17	...	7	...	9
18	...	7	2	...
19	...	7	3	19
20	...	8	1	10
21	...	8	3	...
22	...	9	...	19
23	...	9	2	10
24	...	10	...	...
25	...	10	1	19
26	...	10	3	10
27	...	11	1	...
28	...	11	2	19
29	...	12	...	9
30	...	12	2	...

Weight of Fractions of a Standard.

Fracs.	T.	C.	Q.	LBS.
¼ Std.	...	12	2	...
½ ,,	1	5	...	...
¾ ,,	1	17	2	...
1 ,,	2	10	...	...

Weight of Standards.

Stds.	T.	C.	Q.	LBS.
1	2	10	...	...
2	5	...	...	...
3	7	10	...	...
4	10	...	...	...
5	12	10	...	...
6	15	...	...	...
7	17	10	...	...
8	20	...	...	...
9	22	10	...	...
10	25	...	...	...

Weight of Fractions of One Deal.

Parts in 18ths	Q.	LBS.
1	...	3
2	...	5
3	...	8
4	...	11
5	...	13
6	...	16
7	...	19
8	...	22
9	...	25
10	...	27
11	1	2
12	1	4
13	1	7
14	1	10
15	1	13
16	1	15
17	1	17
18	1	19
In 11ths		
1	...	4
2	...	8
3	...	13
4	...	17
5	...	21
6	...	26
7	1	2
8	1	6
9	1	10
10	1	15
11	1	19

WEIGHT OF TIMBER, SQUARE, HEWN, AND ROUND.

Number of Cubic Feet being given.

No. of feet.	At 40 feet per ton.			At 50 feet per ton.				No. of feet.	At 40 feet per ton.			At 50 feet per ton.			
	T.	C.	Q.	T.	C.	Q.	L.		T.	C.	Q.	T.	C.	Q.	L.
1	0	0	2	0	0	1	16	29	0	14	2	0	11	2	11
2	0	1	0	0	0	3	6	30	0	15	0	0	12	0	6
3	0	1	2	0	1	0	22	31	0	15	2	0	12	1	16
4	0	2	0	0	1	2	11	32	0	16	0	0	12	3	6
5	0	2	2	0	2	0	0	33	0	16	2	0	13	11	22
6	0	3	0	0	2	1	16	34	0	17	0	0	13	2	11
7	0	3	2	0	2	3	6	35	0	17	2	0	14	0	0
8	0	4	0	0	3	0	23	36	0	18	0	0	14	1	16
9	0	4	2	0	3	2	11	37	0	18	2	0	14	3	6
10	0	5	0	0	4	0	0	38	0	19	0	0	15	0	22
11	0	5	2	0	4	1	16	39	0	19	2	0	15	2	11
12	0	6	0	0	4	3	6	40	1	0	0	0	16	0	0
13	0	6	2	0	5	0	22	41	1	0	2	0	16	1	16
14	0	7	0	0	5	2	11	42	1	1	0	0	16	3	6
15	0	7	2	0	6	0	0	43	1	1	2	0	17	0	22
16	0	8	0	0	6	1	16	44	1	2	0	0	17	2	11
17	0	8	2	0	6	3	6	45	1	2	2	0	18	0	0
18	0	9	0	0	7	0	22	46	1	3	0	0	18	1	16
19	0	9	2	0	7	2	11	47	1	3	2	0	18	3	6
20	0	10	0	0	8	0	0	48	1	4	0	0	19	0	22
21	0	10	2	0	8	1	16	49	1	4	2	0	19	2	11
22	0	11	0	0	8	3	6	50	1	5	0	1	0	0	0
23	0	11	2	0	9	0	22	51	1	5	2	1	0	1	16
24	0	12	0	0	9	2	11	52	1	6	0	1	0	3	6
25	0	12	2	0	10	0	0	53	1	6	2	1	1	0	22
26	0	13	0	0	10	1	16	54	1	7	0	1	1	2	11
27	0	13	2	0	10	3	6	55	1	7	2	1	2	0	0
28	0	14	0	0	11	0	22	56	1	8	0	1	2	1	16

WEIGHT OF TIMBER,
SQUARE, HEWN, AND ROUND.

Number of Cubic Feet being given.

(Continued).

No. of feet.	At 40 feet per ton.			At 50 feet per ton.				No. of feet.	At 40 feet per ton.			At 50 feet per ton.			
	T.	C.	Q.	T.	C.	Q.	L.		T.	C.	Q.	T.	C.	Q.	L.
57	1	8	2	1	2	3	6	85	2	2	2	1	14	0	0
58	1	9	0	1	3	0	22	86	2	3	0	1	14	1	16
59	1	9	2	1	3	2	11	87	2	3	2	1	14	3	6
60	1	10	0	1	4	0	0	88	2	4	0	1	15	0	22
61	1	10	2	1	4	1	16	89	2	4	2	1	15	2	11
62	1	11	0	1	4	3	6	90	2	5	0	1	16	0	0
63	1	11	2	1	5	0	22	91	2	5	2	1	16	1	16
64	1	12	0	1	5	2	11	92	2	6	0	1	16	3	6
65	1	12	2	1	6	0	0	93	2	6	2	1	17	0	22
66	1	13	0	1	6	1	16	94	2	7	0	1	17	2	11
67	1	13	2	1	6	3	6	95	2	7	2	1	18	0	0
68	1	14	0	1	7	0	22	96	2	8	0	1	18	1	16
69	1	14	2	1	7	2	11	97	2	8	2	1	18	3	6
70	1	15	0	1	8	0	0	98	2	9	0	1	19	0	22
71	1	15	2	1	8	1	16	99	2	9	2	1	19	2	11
72	1	16	0	1	8	3	6	100	2	10	0	2	0	0	0
73	1	16	2	1	9	0	22	200	5	0	0	4	0	0	0
74	1	17	0	1	9	2	11	300	7	10	0	6	0	0	0
75	1	17	2	1	10	0	0	400	10	0	0	8	0	0	0
76	1	18	0	1	10	1	16	500	12	10	0	10	0	0	0
77	1	18	2	1	10	3	6	600	15	0	0	12	0	0	0
78	1	19	0	1	11	0	22	700	17	10	0	14	0	0	0
79	1	19	2	1	11	2	11	800	20	0	0	16	0	0	0
80	2	0	0	1	12	0	0	900	22	10	0	18	0	0	0
81	2	0	2	1	12	1	16	1000	25	0	0	20	0	0	0
82	2	1	0	1	12	3	6	2000	50	0	0	40	0	0	0
83	2	1	2	1	13	0	22	3000	75	0	0	60	0	0	0
84	2	2	0	1	13	2	11	4000	100	0	0	80	0	0	0

RATES OF CARRIAGE AND COST PER ST. PETERSBURG STANDARD.

The railway rates per ton are generally exactly divisible into *so much per cwt.* For instance, 2/6 per ton is just 1½d. per cwt., and 5/10 is just 3½d. But 6/- would be a fraction over 3½d., hence, such odd rates as 5/10 are charged. *These rates* are therefore *here given*, so that the figures will be of practical use.

Note.—2½ *tons* to the standard is here taken as the estimated weight.

Per ton.		Per std.
2/6	is	6/3
2/11		7/3
3/4		8/4
3/9		9/4
4/2		10/5
4/7		11/5
5/-		12/6
5/5		13/6
5/10		14/7
6/3		15/7
6/8		16/8
7/1		17/8
7/6		18/9
7/11		19/9
8/4		20/10
8/9		21/10
9/2		22/11
9/7		23/11
10/-		25/-
10/5		26/-
10/10		27/1
11/3		28/1
11/8		29/2
12/1		30/2
12/6		31/3
12/11		32/3

Per ton.		Per std.
13/4	is	33/4
13/9		34/4
14/2		35/5
14/7		36/5
15/-		37/6
15/5		38/6
15/10		39/7
16/3		40/7
16/8		41/8
17/1		42/8
17/6		43/9
17/11		44/9
18/4		45/10
18/9		46/10
19/2		47/11
19/7		48/11
20/-		50/-
20/5		51/-
20/10		52/1
21/3		53/1
21/8		54/2
22/1		55/2
22/6		56/3
22/11		57/3
23/4		58/4
23/9		59/4

Per ton.		Per std.
24/2	is	60/5
24/7		61/5
25/–		62/6
25/5		63/6
25/10		64/7
26/3		65/7
26/8		66/8
27/1		67/8

Per ton.		Per std.
27/6	is	68/9
27/11		69/9
28/4		70/10
28/9		71/10
29/2		72/11
29/7		73/11
30/–		75/–

RATES OF CARRIAGE AND COST PER CUBE FOOT.

Timber at 40 cube feet to one ton.

Birch, Oak, Ash, Elm (logs), Mahogany, Teak, Beech, Green Heart, Hickory, and Round Timber generally are computed as weighing 40 cubic feet to the ton.

Rate per Ton.		Rate per Foot.
s. d.		d.
0 10	is	$0\frac{1}{4}$
1 8		$0\frac{1}{2}$
2 6		$0\frac{3}{4}$
3 4		1
4 2		$1\frac{1}{4}$
5 0		$1\frac{1}{2}$
5 10		$1\frac{3}{4}$
6 8		2
7 6		$2\frac{1}{4}$
8 4		$2\frac{1}{2}$
9 2		$2\frac{3}{4}$
10 0		3
10 10		$3\frac{1}{4}$
11 8		$3\frac{1}{2}$
12 6		$3\frac{3}{4}$
13 4		4
14 2		$4\frac{1}{4}$
15 0		$4\frac{1}{2}$

Rate per Ton.		Rate per Foot.
s. d.		d.
15 10	is	$4\frac{3}{4}$
16 8		5
17 6		$5\frac{1}{4}$
18 4		$5\frac{1}{2}$
19 2		$5\frac{3}{4}$
20 0		6
20 10		$6\frac{1}{4}$
21 8		$6\frac{1}{2}$
22 6		$6\frac{3}{4}$
23 4		7
24 2		$7\frac{1}{4}$
25 0		$7\frac{1}{2}$
25 10		$7\frac{3}{4}$
26 8		8
27 6		$8\frac{1}{4}$
28 4		$8\frac{1}{2}$
29 2		$8\frac{3}{4}$
30 0		9

RATES OF CARRIAGE
AND COST PER CUBE FOOT.

Timber at 50 cube feet to one ton.

Pitchpine, Spruce, Whitewood, Redwood, Elm (boards only), Walnut, Maple, Pine, Baltic, Dantzig, Riga, and Memel Fir timber are computed as weighing 50 cubic feet to the ton.

Rate per Ton.			Rate per Foot.	Rate per Ton.			Rate per Foot.
s.	d.		d.	s.	d.		d.
1	0	is	$0\frac{1}{4}$	16	8	is	4
2	1		$0\frac{1}{2}$	17	8		$4\frac{1}{4}$
3	1		$0\frac{3}{4}$	18	9		$4\frac{1}{2}$
4	2		1	19	9		$4\frac{3}{4}$
5	2		$1\frac{1}{4}$	20	10		5
6	3		$1\frac{1}{2}$	21	10		$5\frac{1}{4}$
7	3		$1\frac{3}{4}$	22	11		$5\frac{1}{2}$
8	4		2	23	11		$5\frac{3}{4}$
9	4		$2\frac{1}{4}$	25	0		6
10	5		$2\frac{1}{2}$	26	0		$6\frac{1}{4}$
11	5		$2\frac{3}{4}$	27	1		$6\frac{1}{2}$
12	6		3	28	1		$6\frac{3}{4}$
13	6		$3\frac{1}{4}$	29	2		7
14	7		$3\frac{1}{2}$	30	2		$7\frac{1}{4}$
15	7		$3\frac{3}{4}$				

BOARDS, JOISTS, &c., TO SQUARE YARD.

AVERAGE number of lineal feet of tongued and grooved boards to a square yard.

Allowance has been made for loss in width, owing to the tonguing and grooving.

5 inch wide.... 24 lineal feet.	6 inch wide .... 20 lineal feet
$5\frac{1}{2}$ „ .... 22 „	$6\frac{1}{2}$ „ .... 18 „

7 inch wide.....16 lineal feet.

NUMBER OF DEALS AND BATTENS OF VARIOUS SIZES CONTAINED IN A ST. PETERSBURG STANDARD.

Feet long.	2½ × 7 1358 ft. lineal to std.		3 × 7 1131 ft. lineal to std.		2 × 12 4 × 6 3 × 8 990 ft. lineal to std.		3 × 9 880 ft. lineal to std.		2½ × 12 3 × 10 792 ft. lineal to std.		3 × 11 720 ft. lineal to std.		4 × 9 3 × 12 660 ft. lineal to std.	
	Dls.	ft.	Dls.	ft.	Dls.	ft.	Dls.	ft.	Dls.	ft.	Dls.	ft.	Dls.	ft.
6	226	2	188	3	165	0	146	4	132	0	120	0	110	0
7	194	0	161	4	141	3	125	5	113	1	10	6	94	2
8	169	6	141	3	123	6	110	0	99	0	90	0	82	4
9	150	8	125	6	110	0	97	7	88	0	80	0	73	3
10	135	8	113	1	99	0	88	0	79	2	72	0	66	0
11	123	5	102	9	90	0	80	0	72	0	65	5	60	0
12	113	2	94	3	82	6	73	4	66	0	60	0	55	0
13	104	6	87	0	76	2	67	9	60	12	55	5	50	10
14	97	0	80	11	70	10	62	12	56	8	51	6	47	2
15	90	8	75	6	66	0	58	10	52	12	48	0	44	0
16	84	14	70	11	61	14	55	0	49	8	45	0	41	4
17	79	15	66	9	58	4	51	13	46	10	42	6	38	14
18	75	8	62	15	55	0	48	16	44	0	40	0	36	12
19	71	9	59	10	52	2	46	6	41	13	37	17	34	14
20	67	18	56	11	49	10	44	0	39	12	36	0	33	0
21	64	14	53	18	47	3	41	19	37	15	34	6	31	9
22	61	16	51	9	45	0	40	0	36	0	32	16	30	0
23	59	1	49	4	43	1	38	6	34	10	31	7	28	16
24	56	14	47	3	41	6	36	16	33	0	30	0	27	12
25	54	8	45	6	39	15	35	5	31	17	28	20	26	10
26	52	6	43	13	38	2	33	22	30	12	27	18	25	10
27	50	8	41	24	36	18	32	16	29	9	26	18	24	12

FEET TO A STANDARD.

Number of *Running Feet* of the following sizes of boards, deals, battens, planks, contained in a St. Petersburg Standard:—

1 Std. of				Run ft.
3	×	½	contains	15840
3½	×	½		13577
4	×	½		11880
4½	×	½		10560
5	×	½		9504
5½	×	½		8640
6	×	½		7920
6½	×	½		7310
7	×	½		6788
8	×	½		5940
9	×	½		5280
10	×	½		4752
11	×	½		4320
12	×	½		3960
3	×	⅝		12672
3½	×	⅝		10862
4	×	⅝		9504
4½	×	⅝		8448
5	×	⅝		7603
5½	×	⅝		6912
6	×	⅝		6336
6½	×	⅝		5848
7	×	⅝		5431
8	×	⅝		4752
9	×	⅝		4224
10	×	⅝		3801
11	×	⅝		3456
12	×	⅝		3168
2	×	¾		15840
3	×	¾		10560
3½	×	¾		9052
4	×	¾		7920
4½	×	¾		7040
5	×	¾		6336

1 Std. of				Run ft.
5½	×	¾	contains	5760
6	×	¾		5280
6½	×	¾		4874
7	×	¾		4526
8	×	¾		3960
9	×	¾		3520
10	×	¾		3168
11	×	¾		2880
12	×	¾		2640
4	×	⅞		6789
4½	×	⅞		6035
5	×	⅞		5431
5½	×	⅞		4937
6	×	⅞		4526
6½	×	⅞		4178
7	×	⅞		3879
8	×	⅞		3394
9	×	⅞		3017
10	×	⅞		2716
11	×	⅞		2469
12	×	⅞		2263
4	×	1		5940
4½	×	1		5280
5	×	1		4752
5½	×	1		4320
6	×	1		3960
6½	×	1		3655
7	×	1		3394
8	×	1		2970
9	×	1		2640
10	×	1		2376
11	×	1		2160
12	×	1		1980

FEET TO A STANDARD.

Number of *Running Feet* of the following sizes of boards, battens, deals, planks, contained in a St. Petersburg Standard :—

1 Std. of				Run ft.
5	×	1¼	contains	3801
5½	×	1¼		3456
6	×	1¼		3168
6½	×	1¼		2924
7	×	1¼		2715
8	×	1¼		2376
9	×	1¼		2112
10	×	1¼		1900
11	×	1¼		1728
12	×	1¼		1584
5	×	1½		3168
5½	×	1½		2880
6	×	1½		2640
6½	×	1½		2437
7	×	1½		2263
8	×	1½		1980
9	×	1½		1760
10	×	1½		1584
11	×	1½		1440
12	×	1½		1320
2	×	2		5940
3	×	2		3960
3½	×	2		3394
4	×	2		2970
4½	×	2		2640
5	×	2		2376
5½	×	2		2160
6	×	2		1980
6½	×	2		1828
7	×	2		1697
8	×	2		1485
9	×	2		1320
10	×	2		1188
11	×	2		1080
12	×	2	contains	990
5	×	2½		1900
5½	×	2½		1728
6	×	2½		1584
6½	×	2½		1462
7	×	2½		1358
8	×	2½		1188
9	×	2½		1056
10	×	2½		950
11	×	2½		864
12	×	2½		792
4	×	3		1980
5	×	3		1584
5½	×	3		1440
6	×	3		1320
7	×	3		1131
8	×	3		990
9	×	3		880
10	×	3		792
11	×	3		720
12	×	3		660
4	×	4		1485
5	×	4		1188
6	×	4		990
7	×	4		848½
8	×	4		742⅞
9	×	4		660
10	×	4		594
11	×	4		540
12	×	4		495

SQUARE FEET
TO A ST. PETERSBURG STANDARD.

Number of *Superficial feet* of boards and planks of following thicknesses contained in a St. Petersburg Standard.

1 Std. of	Ft. supr.	1 Std. of	Ft. supr.
$\frac{1}{2}''$ contains	3960	$2''$ contains	990
$\frac{3}{4}''$	2640	$2\frac{1}{2}''$	792
$1''$	1980	$3''$	660
$1\frac{1}{4}''$	1584	$4''$	495
$1\frac{1}{2}''$	1320		

SQUARES TO A STANDARD.

Number of *Squares* of following thicknesses of material contained in a St. Petersburg Standard.

Boards are frequently sold by the *square*, and not by the standard.

Note.—A *square* consists of about 100 feet superficial, irrespective of thickness of wood, but allowance must be made for manufacturing.

1 Std. of	squares.	1 Std. of	squares.
$\frac{1}{2}''$ contains	$39\frac{3}{5}$	$1\frac{1}{2}''$ contains	$13\frac{1}{5}$
$\frac{3}{4}''$	$26\frac{2}{5}$	$2''$	$9\frac{9}{10}$
$1''$	$19\frac{4}{5}$	$2\frac{1}{2}''$	$7\frac{9}{10}$
$1\frac{1}{4}''$	$15\frac{4}{5}$	$3''$	$6\frac{3}{5}$

FEET TO A SQUARE.

Number of *Running feet* contained in a *square*.

A square of	ft. run.	A square of	ft. run.
$12''$ contains	100	$6''$ contains	200
$11''$	$109\frac{1}{11}$	$5\frac{1}{2}''$	$218\frac{2}{11}$
$10''$	120	$5''$	240
$9''$	$133\frac{1}{3}$	$4\frac{1}{2}''$	$266\frac{2}{3}$
$8''$	150	$4''$	300
$7\frac{1}{2}''$	160	$3\frac{1}{2}''$	$342\frac{6}{7}$
$7''$	$171\frac{3}{7}$	$3''$	400
$6\frac{1}{2}''$	$184\frac{8}{13}$		

PRICE OF DEALS PER 12 FT. RUN.

PRICE PER 12 FT. RUN, AT A GIVEN PRICE PER ST. PETERSBURG STANDARD.

	At £8 0	At £8 5	At £8 10	At £8 15	At £9 0	At £9 5	At £9 10	At £9 15	At £10 0
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
3×11	2 8	2 9	2 10	2 11	3 0	3 1	3 2	3 3	3 4
3×10	2 5 1/11	2 6	2 6 10/11	2 7 9/11	2 8 8/11	2 9 7/11	2 10 6/11	2 11 5/11	3 0 4/11
3× 9	2 2 2/11	2 3	2 3 9/11	2 4 7/11	2 5 5/11	2 6 3/11	2 7 1/11	2 7 10/11	2 8 8/11
3× 7	1 8 4/11	1 9	1 9 7/11	1 10 3/11	1 10 10/11	1 11 6/11	2 0 2/11	2 0 9/11	2 1 5/11

	At £10 5	At £10 10	At £10 15	At £11 0	At £11 5	At £11 10	At £11 15	At £12 0	At £12 5
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
3×11	3 5	3 6	3 7	3 8	3 9	3 10	3 11	4 0	4 1
3×10	3 1 3/11	3 2 2/11	3 3 1/11	3 4	3 4 10/11	3 5 9/11	3 6 8/11	3 7 7/11	3 8 6/11
3× 9	2 9 6/11	2 10 4/11	2 11 2/11	3 0	3 0 8/11	3 1 7/11	3 2 5/11	3 3 3/11	3 4 1/11
3× 7	2 2 1/11	2 2 8/11	2 3 4/11	2 4	2 4 7/11	2 5 3/11	2 5 10/11	2 6 6/11	2 7 2/11

	At £12 10	At £12 15	At £13 0	At £13 5	At £13 10	At £13 15	At £14 0	At £14 5	At £14 10
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
3×11	4 2	4 3	4 4	4 5	4 6	4 7	4 8	4 9	4 10
3×10	3 9 5/11	3 10 4/11	3 11 3/11	4 0 2/11	4 1 1/11	4 2	4 2 10/11	4 3 9/11	4 4 8/11
3× 9	3 4 10/11	3 5 8/11	3 6 6/11	3 7 4/11	3 8 2/11	3 9	3 9 9/11	3 10 7/11	3 11 5/11
3× 7	2 7 9/11	2 8 6/11	2 9 4/11	2 9 8/11	2 10 4/11	2 11	2 11 7/11	3 0 3/11	3 0 10/11

PRICE OF DEALS PER 12 FT. RUN.

PRICE PER 12 FT. RUN, AT A GIVEN PRICE PER ST. PETERSBURG STANDARD.

	At £14 15	At £15 0	At £15 5	At £15 10	At £15 15	At £16 0	At £16 5	At £16 10	At £16 15
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
3×11	4 11	5 0	5 1	5 2	5 3	5 4	5 5	5 6	5 7
3×10	4 $5\frac{7}{11}$	4 $6\frac{6}{11}$	4 $7\frac{5}{11}$	4 $8\frac{4}{11}$	4 $9\frac{3}{11}$	4 $10\frac{2}{11}$	4 $11\frac{1}{11}$	5 0	5 $0\frac{10}{11}$
3× 9	4 $0\frac{3}{11}$	4 $1\frac{1}{11}$	4 $1\frac{10}{11}$	4 $2\frac{8}{11}$	4 $3\frac{6}{11}$	4 $4\frac{4}{11}$	4 $5\frac{2}{11}$	4 6	4 $7\frac{9}{11}$
3× 7	3 $1\frac{6}{11}$	3 $2\frac{2}{11}$	3 $2\frac{9}{11}$	3 $3\frac{5}{11}$	3 $4\frac{1}{11}$	3 $4\frac{8}{11}$	3 $5\frac{4}{11}$	3 6	3 $6\frac{7}{11}$

	At £17 0	At £17 5	At £17 10	At £17 15	At £18 0	At £18 5	At £18 10	At £18 15	At £19 0
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
3×11	5 8	5 9	5 10	5 11	6 0	6 1	6 2	6 3	6 4
3×10	5 $1\frac{9}{11}$	5 $2\frac{8}{11}$	5 $3\frac{7}{11}$	5 $4\frac{6}{11}$	5 $5\frac{5}{11}$	5 $6\frac{4}{11}$	5 $7\frac{3}{11}$	5 $8\frac{2}{11}$	5 $9\frac{1}{11}$
3× 9	4 $7\frac{7}{11}$	4 $8\frac{6}{11}$	4 $9\frac{5}{11}$	4 $10\frac{4}{11}$	4 $10\frac{10}{11}$	4 $11\frac{8}{11}$	5 $0\frac{6}{11}$	5 $1\frac{4}{11}$	5 $2\frac{3}{11}$
3× 7	3 $7\frac{3}{11}$	3 $7\frac{10}{11}$	3 $8\frac{6}{11}$	3 $9\frac{2}{11}$	3 $9\frac{9}{11}$	3 $10\frac{5}{11}$	3 $11\frac{1}{11}$	3 $11\frac{8}{11}$	4 $0\frac{4}{11}$

	At £19 5	At £19 10	At £19 15	At £20 0	At £20 5	At £20 10	At £20 15	At £21 0	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	
3×11	6 5	6 6	6 7	6 8	6 9	6 10	6 11	7 0	—
3×10	5 10	5 $10\frac{10}{11}$	5 $11\frac{9}{11}$	6 $0\frac{8}{11}$	6 $1\frac{7}{11}$	6 $2\frac{6}{11}$	6 $3\frac{5}{11}$	6 $4\frac{4}{11}$	—
3× 9	5 3	5 $3\frac{9}{11}$	5 $4\frac{7}{11}$	5 $5\frac{5}{11}$	5 $6\frac{3}{11}$	5 $7\frac{1}{11}$	5 $7\frac{10}{11}$	5 $8\frac{8}{11}$	—
3× 7	4 1	4 $1\frac{7}{11}$	4 $2\frac{3}{11}$	4 $2\frac{10}{11}$	4 $3\frac{6}{11}$	4 $4\frac{2}{11}$	4 $4\frac{9}{11}$	4 $5\frac{5}{11}$	—

SLATE LATHS OR BATTENS.

PRICES OF SLATE LATHS PER HUNDRED FEET AND PER ST. PETERSBURG STANDARD.

Size of Laths.	At per 100 ft.	Cost per Standard.	At per 100 ft.	Cost per Standard.	At per 100 ft.	Cost per Standard.	At per 100 ft.	Cost per Standard.	At per 100 ft.	Cost per Standard.
		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.
2½″ × ¾″	¼d.	0 2 7½	½d.	0 5 3	¾d.	0 7 10½	1d.	0 10 6	2d.	1 1 0
2 × ¾	,,	0 3 3½	,,	0 6 7	,,	0 9 10½	,,	0 13 2	,,	1 6 0
1½ × ¾	,,	0 4 4½	,,	0 8 9	,,	0 13 1½	,,	0 17 6	,,	1 15 0
2 × ⅝	,,	0 3 11½	,,	0 7 11	,,	0 11 10½	,,	0 15 10	,,	1 11 8
1½ × ⅝	,,	0 5 3	,,	0 10 6	,,	0 15 9	,,	1 1 0	,,	2 2 0
2 × ½	,,	0 4 11	,,	0 9 10	,,	0 14 9	,,	0 19 8	,,	1 18 4
1½ × ½	,,	0 6 7	,,	0 13 2	,,	0 19 9	,,	1 6 4	,,	2 12 8
1½ × ⅜	,,	0 8 9½	,,	0 17 7	,,	1 6 4½	,,	1 15 2	,,	3 10 4
2½″ × ¾″	3d.	1 11 6	6d.	3 3 0	9d.	4 14 6	12d.	6 6 0	15d.	7 17 6
2 × ¾	,,	1 19 6	,,	3 19 0	,,	5 18 6	,,	7 18 0	,,	9 17 6
1½ × ¾	,,	2 12 6	,,	5 5 0	,,	7 17 6	,,	10 10 0	,,	13 2 6
2 × ⅝	,,	2 7 6	,,	4 15 0	,,	7 2 6	,,	9 10 0	,,	11 17 6
1½ × ⅝	,,	3 3 0	,,	6 6 0	,,	9 9 0	,,	12 12 0	,,	15 15 0
2 × ½	,,	2 19 0	,,	5 18 0	,,	8 17 0	,,	11 16 0	,,	14 15 0
1½ × ½	,,	3 19 0	,,	7 18 0	,,	11 17 0	,,	15 16 0	,,	19 15 0
1½ × ⅜	,,	5 5 6	,,	10 11 0	,,	15 16 6	,,	21 2 0	,,	26 7 6

SLATE LATHS OR BATTENS.

PRICES OF SLATING BATTENS PER 144 FEET RUN AND PER ST. PETERSBURG STANDARD.

Size of Battens.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.
		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.
¼″ × 3½″	½d.	0 1 4	½d.	0 2 7	¾d.	0 3 11	1d.	0 5 3	4d.	—
¾ × 3	,,	0 1 7	,,	0 3 1	,,	0 4 8	,,	0 6 1	—	—
¼ × 2½	,,	0 1 10	,,	0 3 8	,,	0 5 6	,,	0 7 4	—	—
¾ × 2	,,	0 2 4	,,	0 4 7	,,	0 6 11	,,	0 9 2	—	—
¼ × 1¾	,,	0 2 8	,,	0 5 3	,,	0 7 10	,,	0 10 6	—	—
¾ × 1½	,,	0 3 1	,,	0 6 1	,,	0 9 2	,,	0 12 3	—	—
¼ × 1¼	,,	0 3 8	,,	0 7 4	,,	0 11 0	,,	0 14 8	—	—
¼ × 1	,,	0 4 7	,,	0 9 2	,,	0 13 9	,,	0 18 4	—	—
⅝″ × 3½″	½d.	0 1 7	½d.	0 3 2	¾d.	0 4 9	1d.	0 6 4	—	—
⅝ × 3	,,	0 1 10	,,	0 3 8	,,	0 5 6	,,	0 7 4	—	—
⅝ × 2½	,,	0 2 2	,,	0 4 5	,,	0 6 7	,,	0 8 9	—	—
⅝ × 2	,,	0 2 9	,,	0 5 6	,,	0 8 3	,,	0 11 0	—	—
⅝ × 1¾	,,	0 3 2	,,	0 6 4	,,	0 9 6	,,	0 12 7	4d.	2 10 3
⅝ × 1½	,,	0 3 8	,,	0 7 4	,,	0 11 0	,,	0 14 8	,,	2 18 8
⅝ × 1¼	,,	0 4 5	,,	0 8 10	,,	0 13 3	,,	0 17 7	,,	3 10 5
⅝ × 1	,,	0 5 6	,,	0 11 0	,,	0 16 6	,,	1 2 0	,,	4 8 0

PRICES OF SLATING BATTENS PER 144 FEET RUN AND PER ST. PETERSBURG STANDARD.

Size of Battens.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.
		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.
3/4″ × 3½″	5d.	—	6d.	—	7d.	—	8d.	—	9d.	2 7 2
3/4 × 3	,,	—	,,	—	,,	—	,,	—	,,	2 15 0
3/4 × 2½	,,	—	,,	—	,,	—	,,	—	,,	3 6 0
3/4 × 2	,,	—	,,	—	,,	—	,,	—	,,	4 2 6
3/4 × 1¾	,,	2 12 5	,,	3 2 10	,,	3 13 4	,,	4 3 10	,,	4 14 4
3/4 × 1½	,,	3 1 1	,,	3 13 4	,,	4 5 7	,,	4 17 9	,,	5 10 0
3/4 × 1¼	,,	3 13 4	,,	4 8 0	,,	5 2 8	,,	5 17 4	,,	6 12 0
3/4 × 1	,,	4 11 8	,,	5 10 0	,,	6 8 4	,,	7 8 8	,,	8 5 0
5/8″ × 3½″	5d.	—	6d.	—	7d.	—	8d.	2 10 3	9d.	2 16 7
5/8 × 3	,,	—	,,	—	,,	—	,,	2 18 8	,,	3 6 0
5/8 × 2½	,,	—	,,	—	,,	—	,,	3 10 5	,,	3 19 2
5/8 × 2	,,	—	,,	—	,,	—	,,	4 8 0	,,	4 19 0
5/8 × 1¾	,,	3 2 10	,,	3 15 5	,,	4 8 0	,,	5 0 7	,,	5 13 2
5/8 × 1½	,,	3 13 4	,,	4 8 0	,,	5 2 8	,,	5 17 4	,,	6 12 0
5/8 × 1¼	,,	4 8 0	,,	5 7 7	,,	6 3 2	,,	7 0 9	,,	7 18 5
5/8 × 1	,,	5 10 0	,,	6 12 0	,,	7 14 0	,,	8 16 0	,,	9 18 0

SLATE LATHS OR BATTENS.

PRICES OF SLATING BATTENS PER 144 FEET RUN AND PER ST. PETERSBURG STANDARD.

Size of Battens.	At per 144ft run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.
		£ s. d.		£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.
3/4″ × 3½″	10d.	2 12 5	11d.	2 17 7	1 0	3 2 10	1 1	3 8 1	1 2	3 13 4
3/4 × 3	,,	3 1 1	,,	3 7 3	,,	3 13 4	,,	3 19 5	,,	4 5 6
3/4 × 2½	,,	3 13 4	,,	4 0 8	,,	4 8 0	,,	4 15 4	,,	5 2 8
3/4 × 2	,,	4 11 8	,,	5 0 10	,,	5 10 0	,,	5 19 2	,,	6 8 4
3/4 × 1¾	,,	5 4 9	,,	5 15 3	,,	6 5 9	,,	6 16 2	,,	7 6 8
3/4 × 1½	,,	6 2 3	,,	6 14 5	,,	7 6 8	,,	7 18 11	,,	8 11 1
3/4 × 1¼	,,	7 6 8	,,	8 1 4	,,	8 16 0	,,	9 10 8	,,	10 5 4
3/4 × 1	,,	9 3 4	,,	10 1 8	,,	11 0 0	,,	11 18 4	,,	12 16 8
5/8″ × 3½″	10d.	3 2 10	11d.	3 9 2	1 0	3 15 5	1 1	4 1 8	1 2	4 8 0
5/8 × 3	,,	3 13 4	,,	4 0 8	,,	4 8 0	,,	4 15 4	,,	5 2 8
5/8 × 2½	,,	4 8 0	,,	4 16 9	,,	5 5 7	,,	5 14 5	,,	6 3 2
5/8 × 2	,,	5 10 0	,,	6 1 0	,,	6 12 0	,,	7 3 0	,,	7 14 0
5/8 × 1¾	,,	6 5 8	,,	6 18 3	,,	7 10 10	,,	8 3 5	,,	8 16 10
5/8 × 1½	,,	7 6 8	,,	8 1 4	,,	8 16 0	,,	9 10 8	,,	10 5 4
5/8 × 1¼	,,	8 16 0	,,	9 13 7	,,	10 11 2	,,	11 8 9	,,	12 6 5
5/8 × 1	,,	11 0 0	,,	12 2 0	,,	13 4 0	,,	14 6 0	,,	15 8 0

PRICES OF SLATING BATTENS PER 144 FEET RUN AND PER ST. PETERSBURG STANDARD.

Size of Battens.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.
	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.
2″ × 3½″	1 3	3 18 7	1 4	4 3 10	1 5	4 9 0	1 6	4 14 3	1 7	4 19 6		
2″ × 3	,,	4 11 7	,,	4 17 8	,,	5 3 10	,,	5 10 0	,,	5 16 1		
2″ × 2½	,,	5 10 0	,,	5 17 4	,,	6 4 8	,,	6 12 0	,,	6 19 4		
2″ × 2	,,	6 17 6	,,	7 6 8	,,	7 15 10	,,	8 5 0	,,	8 14 2		
2″ × 1¾	,,	7 17 2	,,	8 7 8	,,	8 18 2	,,	9 8 7	,,	9 19 0		
2″ × 1½	,,	9 3 4	,,	9 15 7	,,	10 7 9	,,	11 0 0	,,	11 12 3		
2″ × 1¼	,,	11 0 0	,,	11 14 8	,,	12 9 4	,,	13 4 0	,,	13 18 8		
2″ × 1	,,	13 15 0	,,	14 13 4	,,	15 11 8	,,	16 10 0	,,	17 8 4		
1⅝″ × 3½″	1 3	4 14 3	1 4	5 0 7	1 5	5 6 10	1 6	5 13 2	1 7	5 19 5		
1⅝″ × 3	,,	5 10 0	,,	5 17 4	,,	6 4 8	,,	6 12 0	,,	6 19 4		
1⅝″ × 2½	,,	6 12 0	,,	7 0 10	,,	7 9 7	,,	7 18 5	,,	8 7 2		
1⅝″ × 2	,,	8 5 0	,,	8 16 0	,,	9 7 0	,,	9 18 0	,,	10 9 0		
1⅝″ × 1¾	,,	9 8 7	,,	10 1 2	,,	10 13 8	,,	11 6 3	,,	11 18 10		
1⅝″ × 1½	,,	11 0 0	,,	11 14 0	,,	12 9 4	,,	13 4 0	,,	13 18 8		
1⅝″ × 1¼	,,	13 4 0	,,	14 1 7	,,	14 19 2	,,	15 16 10	,,	16 14 5		
1⅝″ × 1	,,	16 10 0	,,	17 12 0	,,	18 14 0	,,	19 16 0	,,	20 18 0		

SLATE LATHS OR BATTENS.

PRICES OF SLATING BATTENS PER 144 FEET RUN AND PER ST. PETERSBURG STANDARD.

Size of Battens.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.
	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.
3/4″ × 3½″	1 8	5 4 9	1 9	5 10 0	1 10	5 15 3	1 11	6 0 5	2 0	6 5 8		
3/4 × 3	,,	6 2 2	,,	6 8 4	,,	6 14 6	,,	7 0 7	,,	7 6 8		
3/4 × 2½	,,	7 6 8	,,	7 14 0	,,	8 1 4	,,	8 8 8	,,	8 16 0		
3/4 × 2	,,	9 3 4	,,	9 12 6	,,	10 1 8	,,	10 10 10	,,	11 0 0		
3/4 × 1¾	,,	10 9 6	,,	11 0 0	,,	11 10 6	,,	12 0 11	,,	12 11 5		
3/4 × 1½	,,	12 4 6	,,	12 16 8	,,	13 8 11	,,	14 1 1	,,	14 13 4		
3/4 × 1¼	,,	14 13 4	,,	15 8 0	,,	16 2 8	,,	16 17 4	,,	17 12 0		
3/4 × 1	,,	18 6 8	,,	19 5 0	,,	20 3 4	,,	21 1 8	,,	22 0 0		
5/8″ × 3½″	1 8	6 5 8	1 9	6 12 1	1 10	6 18 4	1 11	7 4 7	2 0	7 10 10		
5/8 × 3	,,	7 6 8	,,	7 14 0	,,	8 1 4	,,	8 8 8	,,	8 16 0		
5/8 × 2½	,,	8 16 0	,,	9 4 9	,,	9 13 7	,,	10 2 5	,,	10 11 2		
5/8 × 2	,,	11 0 0	,,	11 11 0	,,	12 2 0	,,	12 13 0	,,	13 4 0		
5/8 × 1¾	,,	12 11 5	,,	12 4 0	,,	13 16 7	,,	14 9 1	,,	15 1 8		
5/8 × 1½	,,	14 13 4	,,	15 8 0	,,	16 2 8	,,	16 17 4	,,	17 12 0		
5/8 × 1¼	,,	17 12 0	,,	18 9 7	,,	19 7 2	,,	20 4 9	,,	21 2 5		
5/8 × 1	,,	22 0 0	,,	23 2 0	,,	24 4 0	,,	25 6 0	,,	26 8 0		

PRICES OF SLATING BATTENS PER 144 FEET RUN AND PER ST. PETERSBURG STANDARD.

Size of Battens.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.
	s. d.	£ s. d.	s. d	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.
3/4″ × 3 1/2″	2 1	6 10 11	2 2	6 16 2	2 3	7 1 5	2 4	7 6 8	2 5	7 11 10		
3/4 × 3	,,	7 12 9	,,	7 18 10	,,	8 5 0	,,	8 11 1	,,	8 17 2		
3/4 × 2 1/2	,,	9 3 4	,,	9 10 8	,,	9 18 0	,,	10 5 4	,,	10 12 8		
3/4 × 2	,,	11 9 2	,,	11 18 4	,,	12 7 6	,,	12 16 8	,,	13 5 10		
3/4 × 1 3/4	,,	13 1 11	,,	13 12 4	,,	14 2 10	,,	14 13 4	,,	15 3 10		
3/4 × 1 1/2	,,	15 5 7	,,	15 17 10	,,	16 10 1	,,	17 2 4	,,	17 14 5		
3/4 × 1 1/4	,,	18 6 8	,,	19 1 4	,,	19 16 0	,,	20 10 8	,,	21 5 4		
3/4 × 1	,,	22 18 4	,,	23 16 8	,,	24 15 0	,,	25 13 4	,,	26 11 8		
5/8″ × 3 1/2″	2 1	7 17 2	2 2	8 3 5	2 3	8 9 9	2 4	8 16 0	2 5	9 2 3		
5/8 × 3	,,	9 3 4	,,	9 10 8	,,	9 18 0	,,	10 5 4	,,	10 12 8		
5/8 × 2 1/2	,,	11 0 0	,,	11 8 9	,,	11 17 7	,,	12 6 5	,,	12 15 2		
5/8 × 2	,,	13 15 0	,,	14 6 0	,,	14 17 0	,,	15 8 0	,,	15 19 0		
5/8 × 1 3/4	,,	15 14 3	,,	16 6 10	,,	16 19 5	,,	17 12 0	,,	18 4 6		
5/8 × 1 1/2	,,	18 6 8	,,	19 1 4	,,	19 16 0	,,	20 10 8	,,	21 5 4		
5/8 × 1 1/4	,,	22 0 0	,,	22 17 7	,,	23 15 2	,,	24 12 9	,,	25 10 5		
5/8 × 1	,,	27 10 0	,,	28 12 0	,,	29 14 0	,,	30 16 0	,,	31 18 0		

SLATE LATHS OR BATTENS.

PRICES OF SLATING BATTENS PER 144 FEET RUN AND PER ST. PETERSBURG STANDARD.

Size of Battens.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.	At per 144ft. run.	Cost per Standard.
	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.
3/4″ × 3½″	2 6	7 17 1	2 7	8 2 4	2 8	8 7 7	2 9	8 12 10	2 10	8 18 0		
3/4 × 3	„	9 3 4	„	9 9 5	„	9 15 7	„	10 1 8	„	10 7 9		
3/4 × 2½	„	11 0 0	„	11 7 4	„	11 14 8	„	12 2 0	„	12 9 4		
3/4 × 2	„	13 15 0	„	14 14 2	„	14 13 4	„	15 2 6	„	15 11 8		
3/4 × 1¾	„	15 14 3	„	16 4 10	„	16 15 3	„	17 5 8	„	17 16 2		
3/4 × 1½	„	18 6 8	„	18 18 10	„	19 11 1	„	20 3 4	„	20 15 6		
3/4 × 1¼	„	22 0 0	„	22 14 8	„	23 9 4	„	24 4 0	„	24 18 8		
3/4 × 1	„	27 10 0	„	28 8 4	„	29 6 8	„	30 5 0	„	31 3 4		
5/8″ × 3½″	2 6	9 8 7	2 7	9 14 10	2 8	10 1 2	2 9	10 7 5	2 10	10 13 8		
5/8 × 3	„	11 0 0	„	11 7 4	„	11 14 8	„	12 2 0	„	12 9 4		
5/8 × 2½	„	13 4 0	„	13 12 9	„	14 1 8	„	14 10 5	„	14 19 2		
5/8 × 2	„	16 10 0	„	17 1 0	„	17 12 0	„	18 3 0	„	18 14 0		
5/8 × 1¾	„	18 17 1	„	19 9 7	„	20 2 4	—	—	—	—		
5/8 × 1½	„	22 0 0	„	22 14 8	„	23 9 4	—	—	—	—		
5/8 × 1¼	„	26 8 0	„	27 5 7	„	28 3 2	—	—	—	—		
5/8 × 1		33 0 0	„	34 2 0	„	35 4 0	—	—	—	—		

SLATING LATHS TO A STANDARD.

Number of *Running feet* of slating battens contained in a St. Petersburg Standard.

1 Std. of			ft. run.	1 Std. of			ft. run.
$3\frac{1}{2}$ × $\frac{3}{4}$	contains		9051	$2\frac{1}{2}$ × $\frac{5}{8}$	contains		15206
3 × $\frac{3}{4}$	„		10560	2 × $\frac{5}{8}$	„		19008
$2\frac{1}{2}$ × $\frac{3}{4}$	„		12672	$1\frac{3}{4}$ × $\frac{5}{8}$	„		21723
2 × $\frac{3}{4}$	„		15840	$1\frac{1}{2}$ × $\frac{5}{8}$	„		25344
$1\frac{3}{4}$ × $\frac{3}{4}$	„		18103	$1\frac{1}{4}$ × $\frac{5}{8}$	„		30413
$1\frac{1}{2}$ × $\frac{3}{4}$	„		21120	1 × $\frac{5}{8}$	„		38016
$1\frac{1}{4}$ × $\frac{3}{4}$	„		25344	2 × $\frac{1}{2}$	„		23760
1 × $\frac{3}{4}$	„		31680	$1\frac{1}{2}$ × $\frac{1}{2}$	„		31680
$3\frac{1}{2}$ × $\frac{5}{8}$	„		10862	$1\frac{1}{2}$ × $\frac{3}{8}$	„		42240
3 × $\frac{5}{8}$	„		12672				

SLATE MEASURE.

Slates are usually sold 1,200 to the *thousand*.

No. of Slates.	Size of Slates.	Will cover with 3″ lap about square yards.	
1,200 ..	26 by 16 ..	170 or 7	slates to one yard.
„ ..	26 by 15 ..	160 „ $7\frac{1}{2}$	do.
„ ..	24 by 14 ..	136 „ 9	do.
„ ..	24 by 12 ..	116 „ $10\frac{1}{2}$	do.
„ ..	22 by 12 ..	105 „ $11\frac{1}{2}$	do.
„ ..	22 by 11 ..	97 „ $12\frac{1}{2}$	do.
„ ..	20 by 12 ..	94 „ $12\frac{3}{4}$	do.
„ ..	20 by 10 ..	78 „ $15\frac{1}{2}$	do.
„ ..	18 by 10 ..	69 „ $17\frac{1}{2}$	do.
„ ..	18 by 9 ..	62 „ 19	do.
„ ..	16 by 10 ..	60 „ 20	do.
„ ..	16 by 9 ..	54 „ 22	do.
„ ..	$16\frac{1}{2}$ by $8\frac{1}{2}$ ..	53 „ 22	do.
„ ..	16 by 8 ..	48 „ 25	do.
„ ..	14 by 8 ..	41 „ 30	do.
„ ..	13 by 7 ..	32 „ 40	do.

In some parts of the country slating is estimated by the "square" of 100 sup. ft., equal to about 11 square yards.

PRICES per Standard at per running foot and 100 running feet.

The numbers immediately under the width and thickness indicate the number of running feet per Standard of that size.

Per Ft. Run	4×12 (495).			4×11 (540).			4×10 (594).			4×9 (660).			4×8 (742½).			Per 100ft. Run.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
1/16	0	2	7	0	2	10	0	3	1	0	3	5	0	3	10	0	0	6¼
1/8	0	5	2	0	5	8	0	6	2	0	6	11	0	7	9	0	1	0½
3/16	0	10	4	0	11	3	0	12	5	0	13	9	0	15	6	0	2	1
1/4	0	15	6	0	16	11	0	18	7	1	0	8	1	3	3	0	3	1¼
5/16	1	0	8	1	2	6	1	4	9	1	7	6	1	10	11	0	4	2
3/8	1	5	9	1	8	2	1	10	11	1	14	5	1	18	8	0	5	2½
7/16	1	10	11	1	13	9	1	17	2	2	1	3	2	6	5	0	6	3
1/2	1	16	1	1	19	5	2	3	4	2	8	2	2	14	2	0	7	3½
1	2	1	3	2	5	0	2	9	6	2	15	0	3	1	10	0	8	4
1⅛	2	6	5	2	10	8	2	15	8	3	1	11	3	9	7	0	9	4½
1¼	2	11	7	2	16	3	3	1	10	3	8	9	3	17	4	0	10	5
1⅜	2	16	9	3	1	11	3	8	1	3	15	8	4	5	1	0	11	5½
1½	3	1	11	3	7	6	3	14	3	4	2	6	4	12	10	0	12	6
1⅝	3	7	0	3	13	2	4	0	5	4	9	5	5	0	7	0	13	6½
1¾	3	12	2	3	18	9	4	6	8	4	16	3	5	8	3	0	14	7
1⅞	3	17	4	4	4	5	4	12	10	5	3	2	5	16	0	0	15	7½
2	4	2	6	4	10	0	4	19	0	5	10	0	6	3	9	0	16	8
2¼	4	12	10	5	1	3	5	11	5	6	3	9	6	19	3	0	18	9
2½	5	3	2	5	12	6	6	3	9	6	17	6	7	14	8	1	0	10
2¾	5	13	5	6	3	9	6	16	1	7	11	3	8	10	2	1	2	11
3	6	3	9	6	15	0	7	8	6	8	5	0	9	5	7	1	5	0
3¼	6	14	1	7	6	3	8	0	10	8	18	9	10	1	1	1	7	1
3½	7	4	4	7	17	6	8	13	3	9	12	6	10	16	7	1	9	2
3¾	7	14	8	8	8	9	9	5	7	10	6	3	11	12	0	1	11	3
4	8	5	0	9	0	0	9	18	0	11	0	0	12	7	6	1	13	4
4¼	8	15	4	9	11	3	10	10	4	11	13	9	13	3	0	1	15	5
4½	9	5	7	10	2	6	11	2	9	12	7	6	13	18	5	1	17	6
4¾	9	15	11	10	13	9	11	15	1	13	1	3	14	13	11	1	19	7
5	10	6	3	11	5	0	12	7	6	13	15	0	15	9	4	2	1	8
5¼	10	16	7	11	16	3	12	19	10	14	8	9		—		2	3	9
5½	11	6	10	12	7	6	13	12	3	15	2	6		—		2	5	10
5¾	11	17	2	12	18	9	14	4	7		—			—		2	7	11
6	12	7	6	13	10	0	14	17	0		—			—		2	10	0
6¼	12	17	10	14	1	3	15	9	4		—			—		2	12	1
6½	13	8	2	14	12	6	16	1	9		—			—		2	14	2

PRICES per Standard at per running foot and 100 running feet.

The numbers immediately under the width and thickness indicate the number of running feet per Standard of that size.

Per Ft. Run	4×7 (848⅘).			4×6 (990).			3×12 (660).			3×11 (720).			3×10 (792).			Per 100ft. Run.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£.	s	d.
1/16	0	4	5	0	5	2	0	3	5	0	3	9	0	4	2	0	0	6¼
⅛	0	8	10	0	10	4	0	6	11	0	7	6	0	8	3	0	1	0½
¼	0	17	8	1	0	7	0	13	9	0	15	0	0	16	6	0	2	1
⅜	1	6	6	1	10	11	1	0	8	1	2	6	1	4	9	0	3	1½
½	1	15	4	2	1	3	1	7	6	1	10	0	1	13	0	0	4	2
⅝	2	4	2	2	11	6	1	14	5	1	17	6	2	1	3	0	5	2½
¾	2	13	0	3	1	10	2	1	3	2	5	0	2	9	6	0	6	3
⅞	3	1	10	3	12	2	2	8	2	2	12	6	2	17	9	0	7	3½
1	3	10	9	4	2	6	2	15	0	3	0	0	3	6	0	0	8	4
1⅛	3	19	7	4	12	10	3	1	11	3	7	6	3	14	3	0	9	4½
1¼	4	8	5	5	3	1	3	8	9	3	15	0	4	2	6	0	10	5
1⅜	4	17	3	5	13	5	3	15	8	4	2	6	4	10	9	0	11	5½
1½	5	6	1	6	3	9	4	2	6	4	10	0	4	19	0	0	12	6
1⅝	5	14	11	6	14	0	4	9	5	4	17	6	5	7	3	0	13	6½
1¾	6	3	9	7	4	4	4	16	3	5	5	0	6	15	6	0	14	7
1⅞	6	12	7	7	14	8	5	3	1	5	12	6	6	3	9	0	15	7½
2	7	1	5	8	5	0	5	10	0	6	0	0	6	12	0	0	16	8
2⅛	7	10	3	8	15	4	5	16	10	6	7	6	7	0	3	0	17	8½
2¼	7	19	1	9	5	7	6	3	9	6	15	0	7	8	6	0	18	9
2⅜	8	7	11	9	15	11	6	10	8	7	2	6	7	16	9	0	19	9½
2½	8	16	9	10	6	3	6	17	6	7	10	0	8	5	0	1	0	10
2⅝	9	5	7	10	16	7	7	4	5	7	17	6	8	13	3	1	1	10½
2¾	9	14	6	11	6	10	7	11	3	8	5	0	9	1	6	1	2	11
2⅞	10	3	4	11	17	2	7	18	2	8	12	6	9	9	9	1	3	11½
3	10	12	2	12	7	6	8	5	0	9	0	0	9	18	0	1	5	0
3⅛	11	1	0	12	17	10	8	11	11	9	7	6	10	6	3	1	6	0½
3¼	11	9	10	13	8	1	8	18	9	9	15	0	10	14	6	1	7	1
3⅜	11	18	8	13	18	5	9	5	8	10	2	6	11	2	9	1	8	1½
3½	12	7	6	14	8	9	9	12	6	10	10	0	11	11	0	1	9	2
3⅝	12	16	4	14	19	1	9	19	5	10	17	6	11	19	3	1	10	2½
3¾	13	5	2	15	9	4	10	6	3	11	5	0	12	7	6	1	11	3
4	14	2	10	16	10	0	11	0	0	12	0	0	13	4	0	1	13	4

PRICES per Standard at per running foot and 100 running feet.

The numbers immediately under the width and thickness indicate the number of running feet per Standard of that size.

Per Ft. Run	3×9 (880).			3×8½ (932).			3×8 (990).			3×7 (1131⅐).			3×6 (1320).			Per 100ft Run.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
1/16	0	4	7	0	4	10	0	5	2	0	5	11	0	6	11	0	0	6½
⅛	0	9	2	0	9	8	0	10	4	0	11	9	0	13	9	0	1	0½
¼	0	18	4	0	19	5	1	0	7	1	3	7	1	7	6	0	2	1
⅜	1	7	6	1	9	1	1	10	11	1	15	4	2	1	3	0	3	1½
½	1	16	8	1	18	10	2	1	3	2	7	2	2	15	0	0	4	2
5/8	2	5	10	2	8	6	2	11	7	2	18	11	3	8	9	0	5	2½
¾	2	15	0	2	18	3	3	1	10	3	10	9	4	2	6	0	6	3
⅞	3	4	2	3	7	11	3	12	2	4	2	6	4	16	3	0	7	3½
1	3	13	4	3	17	8	4	2	6	4	14	3	5	10	0	0	8	4
1⅛	4	2	6	4	7	4	4	12	10	5	6	0	6	3	9	0	9	4½
1¼	4	11	8	4	17	1	5	3	1	5	17	10	6	17	6	0	10	5
1⅜	5	0	10	5	6	10	5	13	5	6	9	8	7	11	3	0	11	5½
1½	5	10	0	5	16	6	6	3	9	7	1	5	8	5	0	0	12	6
1⅝	5	19	2	6	6	2	6	14	0	7	13	2	8	18	9	0	13	6½
1¾	6	8	4	6	15	11	7	4	4	8	5	0	9	12	6	0	14	7
1⅞	6	17	6	7	5	7	7	14	8	8	16	9	10	6	3	0	15	7½
2	7	6	8	7	15	4	8	5	0	9	8	7	11	0	0	0	16	8
2⅛	7	15	10	8	5	0	8	15	4	10	0	4	11	13	9	0	17	8½
2¼	8	5	0	8	14	9	9	5	7	10	12	2	12	7	6	0	18	9
2⅜	8	14	2	9	4	5	9	15	11	11	3	11	13	1	3	0	19	9½
2½	9	3	4	9	14	2	10	6	3	11	15	9	13	15	0	1	0	10
2⅝	9	12	6	10	3	10	10	16	7	12	7	6	14	8	9	1	1	10½
2¾	10	1	8	10	13	7	11	6	10	12	19	3	15	2	6	1	2	11
2⅞	10	10	10	11	3	3	11	17	2	13	11	1		—		1	3	11½
3	11	0	0	11	13	0	12	7	6	14	2	10		—		1	5	0
3⅛	11	9	2	12	2	8	12	17	10	14	14	8		—		1	6	0½
3¼	11	18	4	12	12	5	13	8	1	15	6	5		—		1	7	1
3⅜	12	7	6	13	2	1	13	18	5		—			—		1	8	1½
3½	12	16	8	13	11	10	14	8	9		—			—		1	9	2
3⅝	13	5	10	14	1	6	14	19	1		—			—		1	10	2½
3¾	13	15	0	14	11	3	15	9	4		—			—		1	11	3
4	14	13	4		—			—			—			—		1	13	4

PRICES per Standard at per running foot and 100 running feet.

The numbers immediately under the width and thickness indicate the number of running feet per Standard of that size.

Per Ft. Run	3 × 5½ (1440).			3 × 5 (1584).			3 × 4½ (1760).			3 × 4 (1980).			Per 100 ft. Run.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s	d.	£	s.	d.
1/16	0	7	6	0	8	3	0	9	2	0	10	4	0	0	6¼
⅛	0	15	0	0	16	6	0	18	4	1	0	8	0	1	0½
¼	1	10	0	1	13	0	1	16	8	2	1	3	0	2	1
⅜	2	5	0	2	9	6	2	15	0	3	1	11	0	3	1½
½	3	0	0	3	6	0	3	13	4	4	2	6	0	4	2
⅝	3	15	0	4	2	6	4	11	8	5	3	2	0	5	2½
¾	4	10	0	4	19	0	5	10	0	6	3	9	0	6	3
⅞	5	5	0	5	15	6	6	8	4	7	4	5	0	7	3½
1	6	0	0	6	12	2	7	6	8	8	5	0	0	8	4
1⅛	6	15	0	7	8	6	8	5	0	9	5	8	0	9	4½
1¼	7	10	0	8	5	0	9	3	4	10	6	3	0	10	5
1⅜	8	5	0	9	1	6	10	1	8	11	6	11	0	11	5½
1½	9	0	0	9	18	0	11	0	0	12	7	6	0	12	6
1⅝	9	15	0	10	14	6	11	18	4	13	8	2	0	13	6½
1¾	10	10	0	11	11	0	12	16	8	14	8	9	0	14	7
1⅞	11	5	0	12	7	6	13	15	0		—		0	15	7½
2	12	0	0	13	4	0	14	13	4		—		0	16	8
2⅛	12	15	0	14	0	6		—			—		0	17	8½
2¼	13	10	0	14	17	0		—			—		0	18	9
2⅜	14	5	0	15	13	6		—			—		0	19	9½
2½	15	0	0		—			—			—		1	0	10

PRICES per Standard at per running foot and 100 running feet.

The numbers immediately under the width and thickness indicate the number of running feet per Standard of that size.

Per Ft. Run	2½×12 (792).			2½×11 (864).			2½×10 (950⅔).			2½×9 (1056).			2½×8 (1188).			Per 100ft. Run.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
1/16	0	4	2	0	4	6	0	4	11	0	5	6	0	6	2	0	0	6¼
⅛	0	8	3	0	9	0	0	9	11	0	11	0	0	12	5	0	1	0½
¼	0	16	6	0	18	0	0	19	10	1	2	0	1	4	9	0	2	1
⅜	1	4	9	1	7	0	1	9	9	1	13	0	1	17	2	0	3	1½
½	1	13	0	1	16	0	1	19	7	2	4	0	2	9	6	0	4	2
⅝	2	1	3	2	5	0	2	9	6	2	15	0	3	1	11	0	5	2½
¾	2	9	6	2	14	0	2	19	5	3	6	0	3	14	3	0	6	3
⅞	2	17	9	3	3	0	3	9	4	3	17	0	4	6	8	0	7	3½
1	3	6	0	3	12	0	3	19	2	4	8	0	4	19	0	0	8	4
1⅛	3	14	3	4	1	0	4	9	1	4	19	0	5	11	5	0	9	4½
1¼	4	2	6	4	10	0	4	19	0	5	10	0	6	3	9	0	10	5
1⅜	4	10	9	4	19	0	5	8	11	6	1	0	6	16	1	0	11	5½
1½	4	19	0	5	8	0	5	18	10	6	12	0	7	8	6	0	12	6
1⅝	5	7	3	5	17	0	6	8	8	7	3	0	8	0	10	0	13	6½
1¾	5	15	6	6	6	0	6	18	7	7	14	0	8	13	3	0	14	7
1⅞	6	3	9	6	15	0	7	8	6	8	5	0	9	5	7	0	15	7½
2	6	12	0	7	4	0	7	18	5	8	16	0	9	18	0	0	16	8
2⅛	7	0	3	7	13	0	8	8	4	9	7	0	10	10	4	0	17	8½
2¼	7	8	6	8	2	0	8	18	2	9	18	0	11	2	9	0	18	9
2⅜	7	16	9	8	11	0	9	8	1	10	9	0	11	15	1	0	19	9½
2½	8	5	0	9	0	0	9	18	0	11	0	0	12	7	6	1	0	10
2⅝	8	13	3	9	9	0	10	7	11	11	11	0	12	19	10	1	1	10½
2¾	9	1	6	9	18	0	10	17	10	12	2	0	13	12	3	1	2	11
2⅞	9	9	9	10	7	0	11	7	8	12	13	0	14	4	7	1	3	11½
3	9	18	0	10	16	0	11	17	7	13	4	0	14	17	0	1	5	0
3½	11	11	0		—			—			—			—		1	9	2

PRICES per Standard at per running foot and 100 running feet.

The numbers immediately under the width and thickness indicate the number of running feet per Standard of that size.

Per Ft. Run	2½×7 (1357⅙).			2½×6½ (1462 2/13).			2½×6 (1584).			2×12 (990).			2×11 (1080).			Per 100ft. Run.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
1/12	0	7	1	0	7	7	0	8	3	0	5	2	0	5	8	0	0	6¼
⅛	0	14	2	0	15	3	0	16	6	0	10	4	0	11	3	0	1	0½
¼	1	8	3	1	10	5	1	13	0	1	0	7	1	2	6	0	2	1
⅜	2	2	5	2	5	8	2	9	6	1	10	11	1	13	9	0	3	1½
½	2	16	7	3	0	11	3	6	0	2	1	3	2	5	0	0	4	2
⅝	3	10	9	3	16	2	4	2	6	2	11	7	2	16	3	0	5	2½
¾	4	4	10	4	11	4	4	19	0	3	1	10	3	7	6	0	6	3
⅞	4	18	11	5	6	7	5	15	6	3	12	2	3	18	9	0	7	3½
1	5	13	2	6	1	10	6	12	2	4	2	6	4	10	0	0	8	4
1⅛	6	7	3	6	17	1	7	8	6	4	12	10	5	1	3	0	9	4½
1¼	7	1	5	7	12	4	8	5	0	5	3	1	5	12	6	0	10	5
1⅜	7	15	7	8	7	6	9	1	6	5	13	5	6	3	9	0	11	5½
1½	8	9	9	9	2	9	9	18	0	6	3	9	6	15	0	0	12	6
1⅝	9	3	10	9	18	0	10	14	6	6	14	1	7	6	3	0	13	6½
1¾	9	18	0	10	13	3	11	11	0	7	4	4	7	17	6	0	14	7
1⅞	10	12	2	11	8	6	12	7	6	7	14	8	8	8	9	0	15	7½
2	11	6	3	12	3	8	13	4	0	8	5	0	9	0	0	0	16	8
2⅛	12	0	5	12	18	11	14	0	6	8	15	4	9	11	3	0	17	8½
2¼	12	14	7	13	14	2	14	17	0	9	5	7	10	2	6	0	18	9
2⅜	13	8	9	14	9	5	15	13	6	9	15	11	10	13	9	0	19	9½
2½	14	2	10	15	4	7		—		10	6	3	11	5	0	1	0	10
2⅝	14	17	0		—			—		10	16	7	11	16	3	1	1	10½
2¾	15	11	2		—			—		11	6	10	12	7	6	1	2	11
2⅞		—			—			—		11	17	2	12	18	9	1	3	11½
3		—			—			—		12	7	6	13	10	0	1	5	0
3⅛		—			—			—		12	17	10	14	1	3	1	6	0½
3¼		—			—			—		13	8	1	14	2	6	1	7	1
3⅜		—			—			—		13	18	5	15	3	9	1	8	1½
3½		—			—			—		14	8	9		—		1	9	2
3⅝		—			—			—		14	19	1		—		1	10	2½

PRICES per Standard at per running foot and 100 running feet.

The numbers immediately under the width and thickness indicate the number of running feet per Standard of that size.

Per Ft. Run	2×10 (1188).			2×9 (1320).			2×8 (1485).			2×7 (1697$\frac{1}{7}$).			2×6$\frac{1}{2}$ (1827$\frac{9}{13}$).			Per 100ft. Run.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
$\frac{1}{16}$	0	6	2	0	6	11	0	7	9	0	8	10	0	9	6	0	0	6$\frac{1}{2}$
$\frac{1}{8}$	0	12	5	0	13	9	0	15	6	0	17	8	0	19	1	0	1	0$\frac{1}{2}$
$\frac{1}{4}$	1	4	9	1	7	6	1	10	11	1	15	4	1	18	1	0	2	1
$\frac{3}{8}$	1	17	2	2	1	3	2	6	5	2	13	0	2	17	2	0	3	1$\frac{1}{2}$
$\frac{1}{2}$	2	9	6	2	15	0	3	1	10	3	10	8	3	16	2	0	4	2
$\frac{5}{8}$	3	1	11	3	8	9	3	17	4	4	8	4	4	15	3	0	5	2$\frac{1}{2}$
$\frac{3}{4}$	3	14	3	4	2	6	4	12	10	5	6	0	5	14	3	0	6	3
$\frac{7}{8}$	4	6	8	4	16	3	5	8	3	6	3	9	6	13	4	0	7	3$\frac{1}{2}$
1	4	19	0	5	10	0	6	3	9	7	1	5	7	12	4	0	8	4
1$\frac{1}{8}$	5	11	5	6	3	9	6	19	2	7	19	1	8	11	5	0	9	4$\frac{1}{2}$
1$\frac{1}{4}$	6	3	9	6	17	6	7	14	8	8	16	9	9	10	5	0	10	5
1$\frac{3}{8}$	6	16	1	7	11	3	8	10	1	9	14	6	10	9	6	0	11	5$\frac{1}{2}$
1$\frac{1}{2}$	7	8	6	8	5	0	9	5	7	10	12	2	11	8	6	0	12	6
1$\frac{5}{8}$	8	0	10	8	18	9	10	1	1	11	9	10	12	7	7	0	13	6$\frac{1}{2}$
1$\frac{3}{4}$	8	13	3	9	12	6	10	16	6	12	7	6	13	6	7	0	14	7
1$\frac{7}{8}$	9	5	7	10	6	3	11	12	0	13	5	2	14	5	8	0	15	7$\frac{1}{2}$
2	9	18	0	11	0	0	12	7	6	14	2	10	15	4	7	0	16	8
2$\frac{1}{8}$	10	10	4	11	13	9	13	2	11	15	0	6		—		0	17	8$\frac{1}{2}$
2$\frac{1}{4}$	11	2	9	12	7	6	13	18	5	15	18	3		—		0	18	9
2$\frac{3}{8}$	11	15	1	13	1	3	14	13	10		—			—		0	19	9$\frac{1}{2}$
2$\frac{1}{2}$	12	7	6	13	15	0	15	9	4		—			—		1	0	10
2$\frac{5}{8}$	12	19	10	14	8	9		—			—			—		1	1	10$\frac{1}{2}$
2$\frac{3}{4}$	13	12	3	15	2	6		—			—			—		1	2	11
2$\frac{7}{8}$	14	4	7		—			—			—			—		1	3	11$\frac{1}{2}$
3	14	17	0		—			—			—			—		1	5	0
3$\frac{1}{8}$	15	9	4		—			—			—			—		1	6	0$\frac{1}{2}$

PRICES per Standard at per running foot and 100 running feet.

The numbers immediately under the width and thickness indicate the number of running feet per Standard of that size.

Per Ft. Run	2×6 (1980).			2×5½ (2160).			2×5 (2376).			2×4½ (2640).			2×4 (2970).			Per 100ft. Run.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
1/16	0	10	4	0	11	3	0	12	6	0	13	9	0	15	6	0	0	6¼
1/8	1	0	8	1	2	6	1	4	9	1	7	6	1	10	11	0	1	0½
1/4	2	1	3	2	5	0	2	9	6	2	15	0	3	1	11	0	2	1
3/8	3	1	11	3	7	6	3	14	3	4	2	6	4	12	10	0	3	1½
1/2	4	2	6	4	10	0	4	19	0	5	10	0	6	3	9	0	4	2
5/8	5	3	2	5	12	6	6	3	9	6	17	6	7	14	8	0	5	2½
3/4	6	3	9	6	15	0	7	8	6	7	15	0	9	5	8	0	6	3
7/8	7	4	5	7	17	6	8	13	3	9	12	6	10	16	7	0	7	3½
1	8	5	0	9	0	0	9	18	0	11	0	0	12	7	6	0	8	4
1 1/8	9	5	8	10	2	6	11	2	9	12	7	6	13	18	5	0	9	4½
1 1/4	10	6	3	11	5	0	12	7	6	13	15	0	15	9	5	0	10	5
1 3/8	11	6	11	12	7	6	13	12	3	15	2	6		—		0	11	5½
1 1/2	12	7	6	13	10	0	14	17	0		—			—		0	12	6
1 5/8	13	8	2	14	12	6		—			—			—		0	13	6½
1 3/4	14	8	9	15	15	0		—			—			—		0	14	7
1 7/8	15	9	5		—			—			—			—		0	15	7½

Per Ft. Run	2×3½ (3394).			2×3 (3960).			2×2 (5940).						Per 100ft. Run.		
	£	s.	d.	£	s.	d.	£	s.	d.				£	s.	d.
1/16	0	17	8	1	0	8	1	10	11		—		0	0	6¼
1/8	1	15	4	2	1	3	3	1	11		—		0	1	0½
1/4	3	10	8	4	2	6	6	3	9		—		0	2	1
3/8	5	6	1	6	3	9	9	5	8		—		0	3	1½
1/2	7	1	5	8	5	0	12	7	6		—		0	4	2
5/8	8	16	9	10	6	3	15	9	5		—		0	5	2½
3/4	10	12	1	12	7	6		—			—		0	6	3
7/8	12	7	6	14	8	9		—			—		0	7	3½
1	14	2	10		—			—			—		0	8	4

PRICE of Boards, various breadths, per lineal foot and per Standard.

Per Foot.	5280 ft. ¾×6 Equal 1 standard.	3960 ft. 1×6 Equal 1 standard.	3168 ft. 1¼×6 Equal 1 standard.	2640 ft. 1½×6 Equal 1 standard.
d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
0¼	5 10 0	4 2 6	3 6 0	2 15 0
0⅜	8 5 0	6 3 9	4 19 0	4 2 6
0½	11 0 0	8 5 0	6 12 0	5 10 0
0⅝	13 15 0	10 6 3	8 5 0	6 17 6
0¾	16 10 0	12 7 6	9 18 0	8 5 0
0⅞	19 5 0	14 8 9	11 11 0	9 12 6
1	22 0 0	16 10 0	13 4 0	11 0 0
1⅛	24 15 0	18 11 3	14 17 0	12 7 6
1¼	27 10 0	20 12 6	16 10 0	13 15 0
1⅜	30 5 0	22 13 9	18 3 0	15 2 6
1½	33 0 0	24 15 0	19 16 0	16 10 0

Per Foot.	4525 ft. ¾×7 Equal 1 standard.	3394 ft. 1×7 Equal 1 standard.	2715 ft. 1¼×7 Equal 1 standard.	2262 ft. 1½×7 Equal 1 standard.
d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
0⅛	2 7 1½	1 15 4¼	1 8 3½	1 3 6¾
0¼	4 14 3	3 10 8½	2 16 7	2 7 1½
0⅜	7 15 4½	5 6 0¾	4 4 10½	3 10 8¼
0½	9 8 6	7 1 5	5 13 2	4 14 3
0⅝	11 15 7½	8 16 9¼	7 1 6	5 17 9¾
0¾	14 2 9	10 12 1½	8 9 0	7 1 4½
0⅞	16 9 10½	12 6 5¾	9 18 0	8 4 11¼
1	18 17 0	14 2 10	11 6 3	9 8 6
1⅛	21 4 1½	15 18 2¼	12 14 6	10 12 0¾
1¼	23 11 3	17 13 6½	14 2 10	11 16 7½
1⅜	25 18 4½	19 8 10¾	15 11 1	13 0 2¼

PRICE of Boards, various breadths, per lineal foot and per Standard.

Per Foot.	3960 ft. ¾×8 Equal 1 standard.	2970 ft. 1×8 Equal 1 standard.	2376 ft. 1¼×8 Equal 1 standard.	1980 ft. 1½×8 Equal 1 standard.
d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
0¼	4 2 6	3 1 10½	2 9 6	2 1 3
0⅜	6 3 9	4 12 9¼	3 14 3	3 1 10½
0½	8 5 0	6 3 9	4 19 0	4 2 6
0⅝	10 6 3	7 14 8¼	6 3 9	5 3 1½
0¾	12 7 6	9 5 7½	7 8 6	6 3 9
0⅞	14 8 9	10 16 6¾	8 13 3	7 4 4½
1	16 10 0	12 7 6	9 18 0	8 5 0
1⅛	18 11 3	13 18 5¼	11 2 9	9 5 7½
1¼	20 12 6	15 9 4½	12 6 6	10 6 3
1⅜	22 13 9	17 0 4¾	13 12 3	11 6 10½
1½	24 15 0	18 11 4	14 17 0	12 7 6

Per Foot.	3520 ft. ¾×9 Equal 1 standard.	2640 ft. 1×9 Equal 1 standard.	2112 ft. 1¼×9 Equal 1 standard.	1760 ft. 1½×9 Equal 1 standard.
d	£ s. d.	£ s. d.	£ s. d.	£ s. d.
0¼	3 13 4	2 15 0	2 4 0	1 16 8
0⅜	5 10 0	4 2 6	3 6 0	2 15 0
0½	7 6 8	5 10 0	4 8 0	3 13 4
0⅝	9 3 4	6 17 6	5 10 0	4 11 8
0¾	11 0 0	8 5 0	6 12 0	5 10 0
0⅞	12 16 8	9 12 6	7 14 0	6 8 4
1	14 13 4	11 0 0	8 16 0	7 6 8
1⅛	16 10 0	12 7 6	9 18 0	8 5 6
1¼	18 6 8	13 15 0	11 0 0	9 3 4
1⅜	20 3 4	15 2 6	12 2 0	10 1 8
1½	22 9 0	16 10 0	13 4 0	11 0 0

PRICE of Boards, various breadths, per lineal foot and per Standard.

Per Foot.	3168 ft. ¾ × 10 Equal 1 standard.	2376 ft. 1 × 10 Equal 1 standard.	1900 ft. 1¼ × 10 Equal 1 standard.	1584 ft. 1½ × 10 Equal 1 standard.
d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
0⅛	6 12 0	4 19 0	3 15 10	3 6 0
0¼	8 5 0	6 3 9	4 14 9½	4 2 6
0⅜	9 18 0	7 8 6	5 13 9	4 19 0
0½	11 11 0	8 13 3	6 12 8½	5 15 6
1	13 4 0	9 18 0	7 11 8	6 12 0
1⅛	14 17 0	11 2 9	8 10 7½	7 8 6
1¼	16 10 0	12 7 6	9 9 7	8 5 0
1⅜	18 3 0	13 12 3	10 8 6½	9 1 6
1½	19 16 0	14 17 0	11 7 6	9 18 0
1⅝	21 9 0	16 1 9	12 6 5½	10 14 6
1¾	23 2 0	17 6 6	13 5 5	11 11 0
1⅞	24 15 0	18 11 3	14 4 4½	12 7 6

Per Foot.	2880 ft. ¾ × 11 Equal 1 standard.	2160 ft. 1 × 11 Equal 1 standard.	1728 ft. 1¼ × 11 Equal 1 standard.	1440 ft. 1½ × 11 Equal 1 standard.
d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1	12 0 0	9 0 0	7 4 0	6 0 0
1⅛	13 10 0	10 2 6	8 2 0	6 15 0
1¼	15 0 0	11 5 0	9 0 0	7 10 0
1⅜	16 10 0	12 7 6	9 18 0	8 5 0
1½	18 0 0	13 10 0	10 16 0	9 0 0
1⅝	19 10 0	14 12 6	11 14 0	9 15 0
1¾	21 0 0	15 15 0	12 12 0	10 10 0
1⅞	22 10 0	16 17 6	13 10 0	11 5 0
2	24 0 0	18 0 0	14 8 0	12 0 0
2¼	27 0 0	20 5 0	16 4 0	13 10 0
2½	30 0 0	22 10 0	18 0 0	15 0 0

PRICE of Boards, various breadths, per lineal foot and per Standard.

Per Foot.	2640 ft. $\frac{3}{4}\times12$ Equal 1 standard.	1980 ft. 1×12 Equal 1 standard.	1584 ft. $1\frac{1}{4}\times12$ Equal 1 standard.	1320 ft. $1\frac{1}{2}\times12$ Equal 1 standard.
d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1	11 0 0	8 5 0	6 12 0	5 10 0
$1\frac{1}{8}$	12 7 6	9 5 7	7 8 6	6 3 9
$1\frac{1}{4}$	13 15 0	10 6 3	8 5 0	6 17 6
$1\frac{3}{8}$	15 2 6	11 6 10	9 1 6	7 11 3
$1\frac{1}{2}$	16 10 0	12 7 6	9 18 0	8 5 0
$1\frac{5}{8}$	17 17 6	13 8 1	10 14 6	8 18 9
$1\frac{3}{4}$	19 5 0	14 8 9	11 11 0	9 12 6
$1\frac{7}{8}$	20 12 6	15 9 4	12 7 6	10 6 3
2	22 0 0	16 10 0	13 4 0	11 0 0
$2\frac{1}{8}$	23 7 6	17 10 7	14 0 6	11 13 9
$2\frac{1}{4}$	24 15 0	18 11 3	14 17 0	12 7 6

Per Foot.	2437 ft. $\frac{3}{4}\times13$ Equal 1 standard.	1828 ft. 1×13 Equal 1 standard.	1462 ft. $1\frac{1}{4}\times13$ Equal 1 standard.	1219 ft. $1\frac{1}{2}\times13$ Equal 1 standard.
d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
$0\frac{1}{2}$	5 1 $6\frac{1}{2}$	3 16 2	3 0 11	2 10 $9\frac{1}{2}$
$0\frac{3}{4}$	7 12 $3\frac{3}{4}$	5 14 3	4 11 $4\frac{1}{2}$	3 16 2
1	10 3 1	7 12 4	6 1 10	5 1 7
$1\frac{1}{4}$	12 13 $10\frac{1}{4}$	9 10 5	7 12 $3\frac{1}{2}$	6 6 $11\frac{3}{4}$
$1\frac{1}{2}$	15 4 $7\frac{1}{2}$	11 8 6	9 2 9	7 12 $4\frac{1}{2}$
$1\frac{3}{4}$	17 15 $4\frac{3}{4}$	13 6 7	10 13 $2\frac{1}{2}$	8 17 9
2	20 6 2	15 4 8	12 4 8	10 3 2
$2\frac{1}{4}$	22 16 $11\frac{1}{4}$	17 2 9	13 15 $1\frac{1}{2}$	11 8 $6\frac{1}{4}$
$2\frac{1}{2}$	25 7 $8\frac{1}{2}$	19 0 10	15 5 7	12 13 11
$2\frac{3}{4}$	27 18 $5\frac{3}{4}$	20 18 11	16 16 $0\frac{1}{2}$	13 19 $3\frac{1}{4}$
3	30 9 3	22 17 0	18 6 6	15 4 9
$3\frac{1}{4}$	33 0 $0\frac{1}{4}$	24 15 1	19 16 $11\frac{1}{2}$	16 10 $1\frac{1}{2}$

EQUIVALENT Prices and number of feet of Boards, per Standard and per Square.

2 in. Boards. 990 super. feet per standard.						1½ in Boards. 1,320 super ft. per standard.					
per sqre.		per stand.		per sqre.	per stand.	per sqre.		per stand.		per sqre.	per stand.
s.	d.	£	s.	d.	£ s. d.	s.	d.	£	s.	d.	£ s. d.
0	3	0	2	6	7 16 0	0	3	0	3	3½	10 7 10
0	6	0	4	11½	7 18 5	0	6	0	6	7	10 11 2
0	9	0	7	5	8 0 11	0	9	0	9	10½	10 14 5
1	0	0	9	11½	8 3 5	1	0	0	13	2	10 17 10
5	0	2	9	6	8 5 10	5	0	3	6	0	11 1 0
6	0	2	19	5	8 8 4	6	0	3	19	2	11 4 5
6	3	3	1	11	8 10 10	6	3	4	2	6	11 7 8
6	6	3	4	5	8 13 3	6	6	4	5	9	11 11 0
6	9	3	6	11	8 15 9	6	9	4	9	1	11 14 3
7	0	3	9	4	8 18 3	7	0	4	12	5	11 17 7
7	3	3	11	10	9 0 7	7	3	4	15	8	12 0 10
7	6	3	14	4	9 3 1	7	6	4	19	0	12 4 2
7	9	3	16	10	9 5 7	7	9	5	2	3	12 7 6
8	0	3	19	2	9 8 1	8	0	5	5	7	12 10 10
8	3	4	1	8	9 10 7	8	3	5	8	10	12 14 1
8	6	4	4	2	9 13 0	8	6	5	12	2	12 17 5
8	9	4	6	8	9 15 6	8	9	5	15	5	13 0 8
9	0	4	9	2	9 18 0	9	0	5	18	9	13 4 0
9	3	4	11	7	10 0 6	9	3	6	2	1	13 7 3
9	6	4	14	1	10 2 11	9	6	6	5	5	13 10 7
9	9	4	17	7	10 5 5	9	9	6	8	8	13 13 10
10	0	4	19	0	10 7 11	10	0	6	12	0	13 17 2
10	3	5	1	6	10 10 5	10	3	6	15	3	14 0 6
10	6	5	4	0	10 12 10	10	6	6	18	7	14 3 10
10	9	5	6	6	10 15 4	10	9	7	1	10	14 7 1
11	0	5	8	11	10 17 10	11	0	7	5	2	14 10 5
11	3	5	11	5	11 0 4	11	3	7	8	5	14 13 8
11	6	5	13	11	11 2 9	11	6	7	11	9	14 17 0
11	9	5	16	4	11 5 3	11	9	7	15	1	15 0 3
12	0	5	18	10	11 7 9	12	0	7	18	5	15 3 7
12	3	6	1	4	11 10 3	12	3	8	1	8	15 6 10
12	6	6	3	10	11 12 8	12	6	8	5	0	15 10 2
12	9	6	6	3	11 15 2	12	9	8	8	3	15 13 5
13	0	6	8	9	11 17 8	13	0	8	11	7	15 16 9
13	3	6	11	3	12 0 2	13	3	8	14	10	16 0 1
13	6	6	13	9	12 2 7	13	6	8	18	2	16 3 4
13	9	6	16	2	12 5 1	13	9	9	1	5	16 6 8
14	0	6	18	8	12 7 6	14	0	9	4	10	16 10 0
14	3	7	1	2	12 10 0	14	3	9	8	1	16 13 3
14	6	7	3	7	12 12 5	14	6	9	11	5	16 16 7
14	9	7	6	1	12 14 11	14	9	9	14	8	16 19 10
15	0	7	8	6	12 17 5	15	0	9	18	0	17 3 2
15	3	7	11	0	12 19 11	15	3	10	1	3	17 6 6
15	6	7	13	6	13 2 5	15	6	10	4	7	17 9 10

EQUIVALENT Prices and number of feet of Boards, per Standard and per Square—*(continued)*.

1¼ in. Boards. 1,584 super. feet per standard.

per sqre.		per stand.			per sqre.		per stand.		
s.	d.	£	s.	d.	s.	d.	£	s.	d.
0	3	0	3	11½	15	9	12	9	6
0	6	0	7	11	16	0	12	13	5
0	9	0	11	10	16	3	12	17	5
1	0	0	15	10	16	6	13	1	4
5	0	3	19	2	16	9	13	5	4
6	0	4	15	0	17	0	13	9	3
6	3	4	19	0	17	3	13	13	3
6	6	5	3	0	17	6	13	17	2
6	9	5	6	11	17	9	14	1	2
7	0	5	10	11	18	0	14	5	1
7	3	5	14	10	18	3	14	9	0
7	6	5	18	10	18	6	14	13	0
7	9	6	2	9	18	9	14	16	11
8	0	6	6	9	19	0	15	0	11
8	3	6	10	8	19	3	15	4	10
8	6	6	14	8	19	6	15	8	10
8	9	6	18	7	19	9	15	12	9
9	0	7	2	7	20	0	15	16	9
9	3	7	6	6	20	3	16	0	8
9	6	7	10	6	20	6	16	4	8
9	9	7	14	5	20	9	16	8	7
10	0	7	18	5	21	0	16	12	7
10	3	8	2	4	21	3	16	16	7
10	6	8	6	4	21	6	17	0	7
10	9	8	10	3	21	9	17	4	6
11	0	8	14	3	22	0	17	8	6
11	3	8	18	2	22	3	17	12	5
11	6	9	2	2	22	6	17	16	5
11	9	9	6	1	22	9	18	0	4
12	0	9	10	1	23	0	18	4	4
12	3	9	14	0	23	3	18	8	3
12	6	9	18	0	23	6	18	12	3
12	9	10	2	0	23	9	18	16	2
13	0	10	5	11	24	0	19	0	2
13	3	10	9	11	24	3	19	4	1
13	6	10	13	10	24	6	19	8	1
13	9	10	17	10	24	9	19	12	0
14	0	11	1	9	25	0	19	16	0
14	3	11	5	9	25	3	19	19	11
14	6	11	9	8	25	6	20	3	11
14	9	11	13	8	25	9	20	7	10
15	0	11	17	7	26	0	20	11	10
15	3	12	1	7	26	3	20	15	9
15	6	12	5	6	26	6	20	19	9

1 in. Boards. 1,980 super ft. per standard.

per sqre.		per stand.			per sqre.		per stand.		
s.	d.	£	s.	d.	s.	d.	£	s.	d.
0	3	0	4	11½	15	9	15	11	10
0	6	0	9	11	16	0	15	16	9
0	9	0	14	10½	16	3	16	1	8
1	0	0	19	10	16	6	16	6	8
5	0	4	19	0	16	9	16	11	7
6	0	5	18	10	17	0	16	16	7
6	3	6	3	9	17	3	17	1	6
6	6	6	8	9	17	6	17	6	6
6	9	6	13	8	17	9	17	11	5
7	0	6	18	8	18	0	17	16	5
7	3	7	3	7	18	3	18	1	4
7	6	7	8	6	18	6	18	6	4
7	9	7	13	5	18	9	18	11	3
8	0	7	18	5	19	0	18	16	2
8	3	8	3	4	19	3	19	1	1
8	6	8	8	4	19	6	19	6	1
8	9	8	13	3	19	9	19	11	0
9	0	8	18	3	20	0	19	16	0
9	3	9	3	2	20	3	20	0	11
9	6	9	8	2	20	6	20	5	11
9	9	9	13	1	20	9	20	10	10
10	0	9	18	0	21	0	20	15	10
10	3	10	2	11	21	3	21	0	9
10	6	10	7	11	21	6	21	5	9
10	9	10	12	9	21	9	21	10	8
11	0	10	17	9	22	0	21	15	7
11	3	11	2	9	22	3	22	0	6
11	6	11	7	9	22	6	22	5	6
11	9	11	12	8	22	9	22	10	5
12	0	11	17	7	23	0	22	15	5
12	3	12	2	6	23	3	23	0	4
12	6	12	7	6	23	6	23	5	4
12	9	12	12	5					
13	0	12	17	5					
13	3	13	2	4					
13	6	13	7	4					
13	9	13	12	3					
14	0	13	17	2					
14	3	14	2	1					
14	6	14	7	1					
14	9	14	12	0					
15	0	14	17	0					
15	3	15	1	11					
15	6	15	6	11					

EQUIVALENT Prices and number of feet of Boards, per Standard and per Square—(*continued*).

⅜ in. Boards. 2263 super. ft. per standard.		½ in. Boards 2640 sup. ft. per stand.			⅝ in. Boards. 3168 sup. ft. per stand.			½ in. Boards. 3960 sup. ft. per stand.		
per sqr.		per stand.			per stand.			per stand.		
s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
0	3	0	5	8	0	6	7½	0	7	11
0	6	0	11	4	0	13	2½	0	15	10
0	9	0	17	0	0	19	9¾	1	3	9
1	0	1	2	8	1	6	5	1	11	8
5	0	5	13	1	6	12	0	7	18	4
6	0	6	15	9	7	18	5	9	10	0
6	3	7	1	7	8	5	0	9	18	0
6	6	7	7	3	8	11	7	10	5	11
6	9	7	12	10	8	18	2	10	13	10
7	0	7	18	4	9	4	9	11	1	9
7	3	8	4	0	9	11	4	11	9	8
7	6	8	9	8	9	18	0	11	17	7
7	9	8	15	4	10	4	7	12	5	6
8	0	9	1	0	10	11	2	12	13	5
8	3	9	6	8	10	17	9	13	1	4
8	6	9	12	4	11	4	5	13	9	3
8	9	9	18	0	11	11	0	13	17	2
9	0	10	3	8	11	17	7	14	5	1
9	3	10	9	4	12	4	3	14	13	0
9	6	10	15	0	12	10	9	15	0	11
9	9	11	0	8	12	17	5	15	8	10
10	0	11	6	4	13	4	0	15	16	10
10	3	11	12	0	13	10	7	16	4	9
10	6	11	17	7	13	17	2	16	12	8
10	9	12	3	3	14	3	10	17	0	7
11	0	12	8	11	14	10	5	17	8	6
11	3	12	14	7	14	17	0	17	16	5
11	6	13	0	3	15	3	7	18	4	4
11	9	13	5	11	15	10	3	18	12	3
12	0	13	11	6	15	16	10	19	0	2
12	3	13	17	2	16	3	5	19	8	1
12	6	14	2	10	16	10	0	19	16	0
12	9	14	8	6	16	16	7	20	3	11
13	0	14	14	2	17	3	2	20	11	10
13	3	14	19	10	17	9	9	20	19	9
13	6	15	5	5	17	16	5	21	7	8
13	9	15	11	2	18	3	0	21	15	7
14	0	15	16	9	18	9	7	22	3	6
14	3	16	2	6	18	16	3	22	11	5
14	6	16	8	2	19	2	10	22	19	4
14	9	16	13	10	19	9	5	23	7	3
15	0	16	19	6	19	16	0	23	15	2
15	3	17	5	1	20	2	8			
15	6	17	10	9	20	9	3			

JOISTS, &c., TO SQUARE YARD.

AVERAGE number of lineal feet of joists, &c., to a square yard.

Allowance has been made for 6 inch wall-hold at each end, and for the last wall joist.

This table will apply to not only flooring joists but to spars, ceiling joists, studding, &c.

12 inch	centre to centre	$10\frac{1}{2}$ feet.
13 inch	,,	$9\frac{3}{4}$ feet.
14 inch	,,	9 feet.
15 inch	,,	$8\frac{1}{2}$ feet.
16 inch	,,	8 feet.

PRICES OF DEALS, &c., PER CUBE FOOT AND PER ST. PETERSBURG STANDARD.

Per cube foot.		Per standard.	Per cube foot.		Per standard.
s. d.		£ s. d.	s. d.		£ s. d.
0 $0\frac{1}{4}$	is	0 3 $5\frac{1}{4}$	1 8	is	13 15 0
0 $0\frac{1}{2}$		0 6 $10\frac{1}{2}$	1 9		14 8 9
0 $0\frac{3}{4}$		0 10 $3\frac{3}{4}$	1 10		15 2 6
0 1		0 13 9	1 11		15 16 3
0 2		1 7 6	2 0		16 10 0
0 3		2 1 3	2 1		17 3 9
0 4		2 15 0	2 2		17 17 6
0 6		4 2 6	2 3		18 11 3
0 9		6 3 9	2 4		19 5 0
1 0		8 5 0	2 5		19 18 9
1 1		8 18 9	2 6		20 12 6
1 2		9 12 6	2 7		21 6 3
1 3		10 6 3	2 8		22 0 0
1 4		11 0 0	2 9		22 13 9
1 5		11 13 9	2 10		23 7 6
1 6		12 7 6	2 11		24 1 3
1 7		13 1 3	3 0		24 15 0

LATHWOOD.

Number of *Cubic feet* contained in a *fathom* of lathwood.

Lathwood is stacked in a *frame* 6 ft. × 6 ft., and the measurement in a fathom varies according to the length of the wood.

One fathom of		cubic ft.
4 ft.	contains	144
4½ ,,		162
6 ,,		216
7 ,,		252
8 ,,		288

A *Cubic fathom* of lathwood is 6 ft. × 6 ft. × 6 ft., and contains 216 ft. cubic.

Weight of lathwood.

An eight-foot fathom of lathwood is reckoned as weighing 3 tons 12 cwt., and the other sizes are in proportion, viz. :—

A fathom of							
7 ft.	weighs	3 tons	3	cwt.	0	qrs.
6 ,,		2 ,,	14	,,	0	,,
4½ ,,		2 ,,	0	,,	2	,,
4 ,,		1 ,,	16	,,	0	,,

METHOD OF SELLING HARDWOOD BOARDS AND PLANKS.

Boards 1 inch and under are sold at foot super.

Planks over 1 inch thick are sold at per foot in the inch, thus, a board of 12 feet long by 12 inch wide and 1¼ inch thick would contain 15 feet of inch.

BROKERS' MAHOGANY MEASURE.

Mahogany is always sold by the superficial foot of inch.

In London and Liverpool, mahogany in the log is measured by what is known as "Brokers' Sale Measure." This measure allows a tare to the buyers of one and a half inches in twelve in the widths and thicknesses; that is to say, a log twelve inches square, actual measure, would only be charged to the buyer as ten and a half inches. A further allowance in the length is also made for any defects in the log, such as shakes in the end or on the sides, bad knots, &c. Altogether, the allowance to the buyer generally ranges from 25 to 33 per cent.; *i.e.*, a log measuring say 200 superficial feet calliper or extreme measure, usually only gives 135 to 150 feet Sale measure.

Mahogany, when sawn into boards, is sold without any allowance, and not by "Brokers' Sale Measure."

Mahogany is generally conveyed by rail and canal at 480 superficial feet of 1×12 to the ton (40 cubic feet).

AMERICAN SAWN LUMBER AND SAWN MAHOGANY.

SYSTEM OF MEASURING IN LONDON.

THE following are the regulations agreed between the London and India Docks Company and the London Section of the Timber Trade Federation of the United Kingdom for the measurement of American sawn lumber and sawn mahogany, which became operative on July 1, 1902.

In these regulations the term "lumber" embraces boards, planks, and scantlings cut from the following: Ash, basswood, black walnut, cedar, cherry, chestnut, cottonwood, elm, hickory, holly, maple, mahogany, oak, poplar, satin walnut, sycamore, and other hardwoods.

(1) The measurement of lumber shall be ascertained by the "American Board Measure Rule," but with the odd feet in the lengths marked.

(2) No allowances are to be made for defects.

(3) The contents shall be returned in superficial feet; all parts of a superficial foot up to and including a half shall be disregarded, and over a half shall be reckoned the next foot.

(4) All lumber under 1in. in thickness shall be measured to the eighth of an inch; 1in. and up, to quarter inches.

(5) The lengths shall be taken to the foot only, odd inches to be disregarded: (*a*) A board measuring 12ft. 11in. must be returned as 12ft. long; and (*b*) a board measuring 13ft. 11in. as 13ft. long, and so on.

(6) In ascertaining the measurement of tapering boards and planks the same shall be taken, as regards width, one third from the narrower end.

(7) The Docks Company shall return planed lumber as actual size: (*a*) Planed to $\frac{7}{8}$in. (*b*) Planed to $\frac{1}{2}$in., and so on.

(8) Piling to thicknesses—Up to 1in. to be piled and returned separately to $\frac{1}{8}$in.; above 1in. to 2in. to be piled and returned separately to $\frac{1}{4}$in.; $2\frac{1}{4}$in., $2\frac{1}{2}$in., and $2\frac{3}{4}$in. to be piled and returned together; 3in. to be piled and returned separately; $3\frac{1}{4}$in., $3\frac{1}{2}$in., and $3\frac{3}{4}$in. to be piled and returned together; 4in. to be piled and returned separately, and so on, the even inches being piled and returned separately. In cases where pieces of more than one thickness are piled together they are to be so shown on the Dock Company's return.

(9) When wood is piled to widths, the widths shall be returned in quarters of an inch, up to and including 6in.; over 6in. all fractions of an inch shall be disregarded.

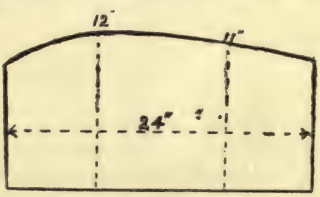
(10) When lumber is stack-piled at reduced rates, the Docks Company will not be required to show the widths unless specially requested to do so, in which case a charge may be made for returning the widths.

(11) In the absence of special instructions from the owners or agents of the goods, the quantity in a stack-pile is to be regulated by the description and thickness of the wood, say, 800 superficial feet of 1in. oak, 1,000 superficial feet of 1in. walnut, 1,200 superficial feet of 1in. whitewood. Other descriptions and thicknesses of wood to be in about the same proportions.

HOW TO MEASURE OAK BILLETS FOR THE WHOLESALE TRADE.

In measuring oak billets, the length is to be taken to a quarter of a foot, and (the bark being previously removed) the breadth and thickness with the callipers at the middle of the billet to a quarter of an inch, observing that the breadth is to be taken at the middle of the square sides and the centre of the mean height (or the thickness) at one-fourth of the breadth in a line drawn from the circular side to its opposite and corresponding square side, perpendicular to the base, and which represents the mean thickness, including in each separate contents every fractional part amount to half a cubic foot.

Thus: Height, $11 + 12 = 23 \div 2 = 11\frac{1}{2}$ mean height.



SKETCH OF OAK BILLET.

Say a billet 15 ft. 9 in. long, 24 in. wide, by $11\frac{1}{2}$ in. height, written $15\frac{3}{4}$, 24, $11\frac{1}{2}$, 30 c. ft.

HOW TO SAW
OCTAGON-SHAPED TIMBER AND SCANTLING.

For Rollers, &c.

To find the exact amount which must be sawn off each corner of a square scantling or log in order to secure an octagon-shaped piece:—

Always divide the sectional diagonal by *seven*. The quotient will give the amount that has to be sawn off each of the four corners in order to make the scantling or log a true octagon in shape.

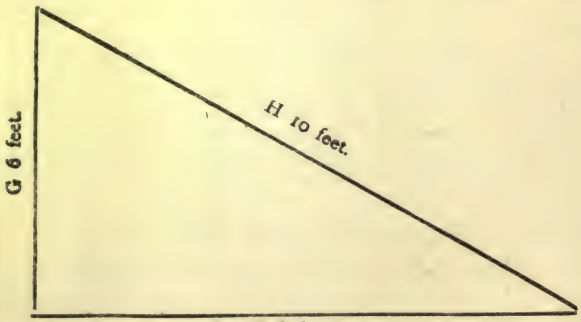
For instance. A scantling or log 10 in. × 10 in. measures across its sectional diagonal—corner to corner—about 14 in. One-seventh of this is two inches, which is the amount to be sawn off the corners, at right angles to the diagonal, in order to produce an octagonal-shaped piece of wood.

The adoption of this system will produce a nicely shaped roller, and save sawyer's time and master's money.

HOW TO LAY OUT LAND, &c.,

TO GET WALLS AT RIGHT ANGLES FOR BUILDING, &c.

In setting out houses, &c., it is required, as a rule, that the gables and division walls, &c., &c., shall be at right angles to the frontage. To get gables, division walls, &c., &c., at right angles to the frontage, take measurements according to the following sketch:—



That is, along the frontage line of the houses, &c., measure off F 8 feet long; from one end of this line take off another measurement G 6 feet long; F and G will then be at right angles to each other when the line H across their extremities measure 10 feet. These lines will be also at right angles to each other if the following three lengths be respectively taken:—

F, 12 feet ...	G, 9 feet ...	H, 15 feet
F, 16 feet ...	G, 12 feet ...	H, 20 feet
F, 24 feet ...	G, 18 feet ...	H, 30 feet
F, 32 feet ..	G, 24 feet ...	H, 40 feet
F, 64 feet ...	G, 48 feet ...	H, 80 feet

FOREIGN EXCHANGE
CONVERSION TABLES.

SHOWING the equivalent prices in Pounds sterling, Francs, Marks, and Florins.

£	s.	d.	Francs.	R Marks.	Florins
1	0	0	25·25	20·40	12·10
3	10	0	88·37	71·40	42·35
3	11	3	89·95	72·68	43·11
3	12	6	91·53	73·95	43·86
3	13	9	93·11	75·23	44·62
3	15	0	94·69	76·50	45·38
3	16	3	96·27	77·78	46·13
3	17	6	97·84	79·05	46·89
3	18	9	99·42	80·33	47·64
4	0	0	101·00	81·60	48·40
4	1	3	102·58	82·88	49·16
4	2	6	104·16	84·15	49·91
4	3	9	105·73	85·43	50·67
4	5	0	107·31	86·70	51·43
4	6	3	108·89	87·98	52·18
4	7	6	110·47	89·25	52·94
4	8	9	112·04	90·53	53·69
4	10	0	113·63	91·80	54·45
4	11	3	115·20	93·08	55·21
4	12	6	116·78	94·35	55·96
4	13	9	118·36	95·63	56·72
4	15	0	119·94	96·90	57·48
4	16	3	121·52	98·18	58·23
4	17	6	123·09	99·45	58·99
4	18	9	124·67	100·73	59·74
5	0	0	126·25	102·00	60·50
5	1	3	127·83	103·28	61·26
5	2	6	129·41	104·55	62·01
5	3	9	130·98	105·83	62·77
5	5	0	132·56	107·10	63·53
5	6	3	134·14	108·38	64·28
5	7	6	135·72	109·65	65·04
5	8	9	137·30	110·93	65·79
5	10	0	138·88	112·20	66·55
5	11	3	140·45	113·48	67·31
5	12	6	142·03	114·75	68·06
5	13	9	143·61	116·03	68·82
5	15	0	145·19	117·30	69·58
5	16	3	146·77	118·58	70·33
5	17	6	148·34	119·85	71·09
5	18	9	149·92	121·13	71·84
6	0	0	151·50	122·40	72·60
6	1	3	153·08	123·68	73·36

FOREIGN EXCHANGE (*continued*).

£	s.	d.	Francs.	R Marks.	Florins.
6	2	6	154·66	124·95	74·11
6	3	9	156·23	126·28	74·87
6	5	0	157·81	127·50	75·63
6	6	3	159·39	128·78	76·38
6	7	6	160·97	130·05	77·14
6	8	9	162·55	131·33	77·89
6	10	0	164·13	132·60	78·65
6	11	3	165·70	133·88	79·41
6	12	6	167·28	135·15	80·16
6	13	9	168·86	136·43	80·92
6	15	0	170·44	137·70	81·68
6	16	3	172·02	138·98	82·43
6	17	6	173·59	140·25	83·19
6	18	9	175·17	141·53	83·94
7	0	0	176·75	142·80	84·70
7	1	3	178·33	144·08	85·45
7	2	6	179·91	145·35	86·21
7	3	9	181·48	146·63	86·97
7	5	0	183·06	147·90	87·73
7	6	3	184·64	149·18	88·48
7	7	6	186·22	150·45	89·24
7	8	9	187·80	151·73	89·99
7	10	0	189·38	153·00	90·75
7	11	3	190·95	154·28	91·51
7	12	6	192·53	155·55	92·26
7	13	9	194·11	156·83	93·02
7	15	0	195·69	158·10	93·78
7	17	3	197·27	159·38	94·53
7	17	6	198·84	160·65	95·28
7	18	9	200·42	161·93	96·04
8	0	0	202·00	163·20	96·80
8	1	3	203·58	164·48	97·56
8	2	6	205·16	165·75	98·31
8	3	9	206·73	167·03	99·07
8	5	0	208·31	168·30	99·83
8	6	3	209·89	169·58	100·58
8	7	6	211·47	170·85	101·34
8	8	9	213·05	172·13	102·09
8	10	0	214·63	173·40	102·85
8	11	3	216·20	174·68	103·61
8	12	6	217·78	175·95	104·36
8	13	9	219·36	177·23	105·12
8	15	0	220·94	178·50	105·88
8	16	3	222·52	179·78	106·63
8	17	6	224·09	181·05	107·39
8	18	9	225·67	182·38	108·14
9	0	0	227·25	183·60	108·90

IMPERIAL AND METRIC MEASURES.

Imperial to Metric.

Linear Measure

1 inch	=	25·39954113 millimetres.
1 foot (12in.)	=	0·30479449 metre.
1 yard (3ft.)	=	0·91438348 ,,
1 pole (5½ yds.)	=	5·02911 metres.
1 chain (22 yds. = 100links)	=	20·11644 ,,
1 furlong (220 yds.)	=	201·16437 ,,
1 mile (1,760 yds.)	=	1·60931493 kilometres.

Square Measure

1 square inch	=	6·45137 sq. centimetres.
1 sq. ft. (144 sq. in.)	=	9·28997 sq. decimetres.
1 sq. yd. (9 sq. ft.)	=	0·83609715 sq. metre.
1 perch (30¼ sq. yds.)	=	25·29194 sq. metres.
1 rood (40 perches)	=	10·11678 acres.
1 acre (4,840 sq. yds.)	=	0·40467 hectare.
1 sq. mile (640 acres)	=	258·98945312 hectares.

Cubic Measure

1 cub. inch	=	16·38617589 cub. centimetres.
1 cub. ft. (1,728 cub. in.)	=	0·02832 cub. metre = 28·31531 cub.dec.
1 cub. yard (27 cub. ft.)	=	0·76451342 cub. metres.

Metric to Imperial.

Linear Measure

1 millimetre (mm.) ($\frac{1}{1000}$ m.)	=	0·03937 inch.
1 centimetre ($\frac{1}{100}$ m.)	=	0·39371 ,,
1 decimetre ($\frac{1}{10}$ m.)	=	3·93708 inches.
1 metre (m.) = 39·37079 inches	=	3·28088917 feet. 1·09363306 yards.
1 decametre (10 m.)	=	10·93633 yards.
1 hectometre (100 m.)	=	109·36331 ,,
1 kilometre (1,000 m.)	=	0·62138 mile.
1 myriametre (10,000 m.)	=	6·21382 miles.

Square Measure

1 square centimetre	=	0·15501 square inch.
1 square decimetre (100 sq. centim.)	=	15·50059 square inches.
1 square metre or centiare (100 sq. decim.)	=	10·76430 square feet. 1·19603 square yard.
Are (100 sq. m.)	=	119·60333 square yards.
hectare (100 ares = 10,000 sq. m.)	=	2·47114 acres.

Cubic Measure

1 cubic centimetre (c.c.) (1,000 cubic millimetres)	=	0·06103 cubic inch.
1 cubic decimetre (c.d.) (1,000 c.c.)	=	61·02705 cubic inches.
1 cubic metre or stere (1,000 c.d.)	=	35·31658074 cubic feet. 1·30802151 cubic yard.

ENGLISH AND FOREIGN MILES COMPARED.

English Statute Mile (1,760 yds.)	= 1·00	Ancient Irish mile	= 1·273
Roman mile	= ·9193	Italian mile	= 1·151
English nautical mile	= 1·153	Norwegian mile	= 6·922
German nautical mile	= 4·604	Russian verst	= 0·66
Austrian mile	= 4·714	French kilometre	= 0·621
Danish ,,	= 4·681	Spanish league	= 4·151
Swedish ,,	= 6·623	Swiss ,,	= 2·983
Short German ,,	= 3·897	Turkish berri	= 1·04
Long ,, ,,	= 5·753	Chinese Li about $\frac{1}{3}$ of a geographical mile	
Ancient Scotch,,	= 1·127	Japanese Ri	= 2·25

Foreign Moneys and British Equivalents.

Country.	Principal Coins.	Stg. s.	Stg. d.
Austria –	100 new kreuzers = 1 florin – –	1	8
Belgium –	100 centimes = 1 franc – –	0	9½
Canada, &c. –	100 cents = dollar – – –	4	0
China – –	1600/1700 copper cash = 1 Haikwan-tael – – – – –	4	10¼
Denmark –	100 öre = 1 krone – – –	1	1⅛
France – –	100 centimes = 1 franc – –	0	9½
	Milliard = f. 1000 mills. = £40,000,000		
Germany –	North German or Prussian Thaler –	3	0
	South German florin or gulden –	1	8
	Imperial Reichsmark = 100 Pfennige	1	0
	Imperial gold piece of 20 marks	20	0
Greece –	100 centimes = 1 franc – – –	0	9
Holland –	100 cents or 20 stivers = 1 florin –	1	8
India – –	192 pie = 64 pice = 16 annas = 1 rupee, about (The lac is 100,000 rupees.) –	1	3
Italy – –	100 centesimi = 1 lira – – –	0	9½
Norway –	100 öre = krone – – – –	1	1⅛
Portugal –	1000 reis = 1 milrei – – –	4	5
Russia –	100 copecs = 1 silver rouble – –	3	2
Spain – –	100 centisimos = 1 peseta = 4 reales	0	9½
Sweden –	100 öre = 1 krone – – –	1	1⅛
Switzerland –	100 rappen or centimes = 1 franc –	0	9½
Turkey –	100 piastre = 1 lira, *variable* – –	1½d. to	2⅓
United States	100 cents = 1 dollar ($) in gold –	4	1
	10 dollars = 1 eagle – – –	41	1

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